

*This hand initialed
Work Plan is the Work Plan
referenced in the RI/FS A.O.*

*JRC
8/22/86*

WORK PLAN
FOR
SOUTH CAVALCADE STREET
HOUSTON, TEXAS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

001104

March 18, 1985

COMPANY CONFIDENTIAL

This Work Plan, prepared by the REM II Team in accordance with the
items of USEPA Contract No. 68-01-6939, is Company Confidential

Work Assignment No.: 46-6L56

Document No.: 143-WP1-WP-ATEW-2

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CDM

environmental engineers, scientists,
planners, & management consultants

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SUPERFUND BRANCH

CAMP DRESSER & MCKEE INC.

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March 18, 1985

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Project: REM II - EPA Contract No. 68-01-6939/143/WP1

Document No.: 143-WP1-WP-ATEW-2

Subject: Work Plan
South Cavalcade Street
Houston, Texas

Dear Mr. Nott and Mr. Cochran:

Camp Dresser & McKee Inc. (CDM) is pleased to submit Volume 1 of the Work Plan for the South Cavalcade Street Site. It consists of two volumes: Volume 1 is the technical portion of the Work Plan; Volume 2 contains the costs. These costs are estimates, and they assume the use of outside, private, and subsurface investigations using contractors approved for Basic Ordering Agreements under our REM II contract.

These two volumes of the Work Plan are accompanied by three other documents: an Interim Site Characterization Report, a Site Plan, and a Project Operations Plan (POP). This makes a complete package. Only the technical portion of the Work Plan has been revised from the draft documents submitted February 22, 1985. Insufficient time prevented completing these documents in final form.

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CAMP DRESSER & McKEE INC.

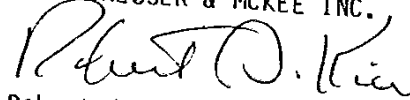
Mr. Sam Nott
Mr. John Cochran
March 18, 1985
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Lack of time also prevented us from following our established review procedure. Thus, no corporate officer has signed this document and our National Program Management Office in Annandale, Virginia has not approved the final Work Plan.

Call us if you have comments or questions.

Sincerely,

CAMP DRESSER & McKEE INC.



Robert S. Kier, Ph.D.
Site Manager

RSK/mem

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PERFORMANCE OF REMEDIAL RESPONSE
ACTIVITIES AT UNCONTROLLED HAZARDOUS
WASTE SITES (REM II)

U.S. EPA CONTRACT NO. 68-01-6939

WORK PLAN
FOR
SOUTH CAVALCADE STREET SITE

HOUSTON, TEXAS

EPA Work Assignment No.: 47-6L56
REM II Document No.: 143-WP1-WP-ATEW-2

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was initiated, however, the bond referendum necessary for the continued development of the Houston Regional Rail System failed, and further work was cancelled. Although CDM's work was incomplete, their three volume report, "Cavalcade Contaminant Survey", dated July 11, 1983, nevertheless provides the most detailed documentation of the nature and extent of contamination at the South Cavalcade Street Site.

In April 1984, TDWR recommended the South Cavalcade Street Site for inclusion on the updated National Priority List (NPL) with a Hazard Ranking of 38.7. In response to initiatives by TDWR, Koppers retained MEI to perform further site investigations. A MEI report, dated May 8, 1984, presents the results of that study. On October 2, 1984, the site was placed on the NPL. CDM was assigned the site under the REM II program in December, 1984.

as EPA's contractor JRC 3/25/85

The Work Plan details a total of sixteen tasks to be performed in carrying out the Remedial Investigation and the Feasibility Study at the South Cavalcade Street Site. These tasks are as follows:

- TASK 0 - Develop Work Plan
- TASK 1 - Compile and Evaluate Background Information
- TASK 2 - Perform Field Investigations
- TASK 3 - Perform Endangerment Assessment
- TASK 4 - Prepare Immediate Remedial Investigation Report
- TASK 5 - Prepare Draft Remedial Investigation Report
- TASK 6 - Prepare Final Remedial Investigation Report
- TASK 7 - Develop Remedial Alternatives
- TASK 8 - Screen Remedial Alternatives
- TASK 9 - Perform Laboratory Studies/Pilot Testing
- TASK 10 - Evaluate Remedial Alternatives
- TASK 11 - Develop Conceptual Design
- TASK 12 - Prepare Draft Feasibility Study Report
- TASK 13 - Prepare Final Feasibility Study Report
- TASK 14 - Perform EPA Designated Activities
- TASK 15 - Reporting and Management

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An additional document or set of documents addressing the following must be prepared:

- Health and safety plans, governing all on-site investigations;
- Quality assurance and quality control plans, governing all on-site work, laboratory analyses, work conducted by outside contractors and data validation;
- Field sampling and analyses plan, governing specific procedures for the collection of samples and for the laboratory analyses and the disposal of all excess materials;
- Site management plan, detailing site operations and site security, and including contingency plans; and
- Data management plan, containing the basic guidelines for recording and preserving data.

The Project Operations Plan (POP), prepared by CDM is provided as an example. The POP is a combination of site specific health and safety plans, quality assurance and quality control plans, and sampling and analytical plans. It ~~is~~ ^{GRC 3/25/85} a basic guidance document for all field and analytical activities as well as quality assurance throughout the RI/FS work. Koppers shall be responsible for production of the pertinent plans governing their work and shall present those plans for review and approval by EPA prior to initiating onsite investigations.

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scale wood treatment operation just north of the present-day Cavalcade Street in the early 1950's.

The KCI property south of the present-day Cavalcade Street was transferred by recorded deed to Merchants Fast Motor Lines (Meridian Transport Company) in 1962. The property was subsequently subdivided into three ownership tracts, as shown previously on Figure 2-2. A northern portion of about 22.5 acres was transferred to the Baptist Foundation of Texas. This tract has been leased and developed by the Transcon Trucking Lines, with a sublease to AJF Leasing, Inc.

A central tract of about 18.2 acres remains in the ownership of the Meridian Transport Company and is presently undeveloped and idle. The southern tract of about 28.3 acres was subdivided into two tracts after its acquisition by Meridian Transport Company in 1962. The southeastern 13.4 acres is owned by Rex ^{King JPL 3/25/85} ~~King~~ and presently used by Palletized Trucking, Inc. The southwestern tract of 14.9 acres remains in the ownership of Meridian Transport Company and is developed for use of the Merchants Fast Motor Lines.

2.1.4 HISTORY OF RESPONSE ACTIONS

The Houston Metropolitan Transit Authority (MTA), as part of its proposed METRO-Stage One Regional Rail System (RRS) study, investigated the feasibility of including the property designated in this report as the South Cavalcade Street Site as a yard, shop and terminal facility for the RRS. Under contract to the Houston Transit Consultants (HTC), prime contractor to the MTA, the firm McClelland Engineers, Inc. (MEI) was selected to perform a geotechnical investigation of the site. During the course of that investigation, observations were made of probable contamination of the site with toxic waste materials from previous commercial or industrial areas.

At that time (early 1983), the state agency responsible for hazardous waste control, the Texas Department of Water Resources (TDWR), was notified of the probable contamination of the site. The TDWR then initiated the

TABLE 3-1

REQUIREMENTS, ADVISORIES, AND GUIDANCE TO BE CONSIDERED

1. Federal Requirements, Advisories and Procedures

- Recommended Maximum Concentration Limits (RMCLs)
- Health Advisories, EPA, Office of Water
- Federal Water Quality Criteria

Note: Federal water quality criteria are not legally enforceable. State water quality standards, developed using appropriate aspects of cases, States' water quality standards do not include specific numerical limitations on a large number of priority pollutants. When there are no numerical State standards for a given pollutant, Federal water quality criteria should be considered.

- Public health basis in listing decision under Section 112 of the Clean Air Act
- EPA's groundwater protection strategy
- TSCA health data
- TSCA chemical advisories (two or three issued to date)
- Advisories issued by FWS and NWFS under the Fish and Wildlife Coordination Act
- National Environmental Policy Act
- TSCA Compliance Program Policy
- Resource Conservation and Recovery Act

2. State Requirements

- Texas Department of Water Resources State Ground Water Withdrawal Approvals
- Requirements of TDWR hazardous waste program
- State Implementation Plan and Delegated Programs Under Clean Air Act
- Texas Department of Health Drinking Water Criteria
- All other State requirements, not delegated through EPA authority.

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TABLE 3-1 (continued)

3. Local Requirements

- Standards of National Pollutant Discharge Elimination System permit for local publicly-owned wastewater treatment facility.
- Local solid waste management ordinances
- Local zoning laws and regulations
- Other local requirements

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These qualitative determinations will be substantiated with an evaluation of the basic processes involved in wood preserving operations, the physical and chemical properties of the materials used to treat the lumber, and with such tests as the EP toxicity. Unfortunately, there are no currently promulgated environmental criteria or standards for contaminants in soils, except for PCB-contaminated soils which are subject to TSCA limits. It will, therefore, be necessary to consult with EPA to review the ^{Endangerment} ~~exposure~~ assessments and determine an appropriate range of cleanup levels for contaminated soils at the South Cavalcade Street Site.

Assessment
JRC 3/25/85

JRC
3/25/85

3.2.4 CONTAMINANT CRITERIA FOR SURFACE WATER

The principal criteria for surface water are water quality standards promulgated by EPA and the State of Texas to protect the public health or welfare and enhance water quality. Toxic pollutants are emphasized by current EPA regulations as the basis for permit limitations under the National Pollutant Discharge Elimination System. However, Texas standards do not include numerical criteria for many toxic chemicals, although there is a general narrative requirement that waters must not contain toxic substances in toxic amounts. In the absence of state numerical criteria, EPA water quality criteria will be used as the basis for evaluating cleanup actions at the South Cavalcade Street Site. These criteria are listed on Table 3-4. Final cleanup levels for the site will be based on the numerical criteria and review of the Endangerment Assessment with EPA. Additionally, the drinking water standards listed in Table 3-3 will also be applicable to surface water.

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3.2.5 CONTAMINANT CRITERIA FOR AIR QUALITY

Air emissions from the South Cavalcade Street Site produces no significant impact to contiguous areas. The site, located in greater Houston (Harris County), has an air quality consistent with other areas of the city. The site location is in an area classified as nonattainment (not presently meeting national ambient air quality standard - NAAQS) for both ozone and total suspended particulates. The greater Houston area is classified as being in attainment for sulfur dioxide, nitrogen oxides and carbon

monoxide. The existing trucking operations may contribute in small quantities to the nitrogen oxides and carbon monoxide levels.

No direct sources of air contamination from the previous creosoting and wood preserving operations exist. All potential disposal and operations areas are presently covered with fill or vegetation. This provides a barrier which prevents direct contact between these potential sources and the air. Although waste products from this site contain odorous compounds that would degrade ambient air quality, this barrier prevents diffusion of these compounds into the ambient atmosphere. Only upon exposure of the underlying contaminated soils through investigation and/or construction activities could air quality degradation in the immediate area possibly occur. As discussed previously, the waste creosote products disposal at this site appear to have been subjected to environmental degradation; available data suggest that only refractory non-volatile compounds remain. As a result, no major concentrations of volatile organics which might influence the ambient atmosphere are expected. Thus, no significant impact to local or regional air quality is expected.

In the event that remedial action at the site involves excavation, federal and state air quality regulations must be followed. Tables 3-5 through 3-7 below summarize the federal and state standards on air pollutants of potential concern at this site.

If incineration is included as part of a remedial action, federal and state emissions standards as well as ambient air quality standards must be addressed. Table 3-7 outlines federal and state emissions regulations concerning the pollutants that may be of concern at this site.

3.3 PRELIMINARY IDENTIFICATION OF DATA GAPS AND ISSUES RELATED TO EVALUATING ALTERNATIVES

For each of the identified Remedial Alternatives, the data required to assess, screen, and evaluate the alternatives have been identified. These data requirements have been compared to the existing information in order to delineate supplemental data needs. Composite requirements of the

4.0 SCOPE OF WORK

4.1 DEVELOPMENT OF A WORK PLAN

4.1.1 OBJECTIVE

The Work Plan is the principal guidance document for performing Remedial Investigations and Feasibility Studies (RI/FS) at abandoned or uncontrolled waste disposal sites. The Work Plan details the tasks to be performed, the samples to be collected and the analyses and evaluations to be made in order to assess the most feasible source control and remedial action alternative and to arrive at a conceptual design of the control actions for the site.

4.1.2 APPROACH

Fifteen tasks have been formulated to carry out the Remedial Investigation and the Feasibility Study for the South Cavalcade Street Site.

The Remedial Investigation portion of this Work Plan may be amended by mutual agreement of EPA and Koppers. Such amendments shall be in writing and shall have as an effective date the date on which such amendments are signed by EPA.

- TASK 0-Develop Work Plan
- TASK 1-Compile and Evaluate Background Information
- TASK 2-Perform Field Investigations
- TASK 3-Perform Endangerment Assessment
- TASK 4-Prepare Draft Remedial Investigation Report
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- TASK 10-Develop Conceptual Design
- TASK 11-Prepare Draft Feasibility Study Report
- TASK 12-Prepare Final Feasibility Study Report
- TASK 13-Perform EPA Designated Activities
- TASK 14-Reporting and Management

A major portion of the work necessary to complete Task 0 for the South Cavalcade Street Site, has been completed in the preparation of this Work Plan. Ancillary documents prepared along with the Work Plan include:

- The Interim Site Characterization Report
- Site Plans.

In addition to the Work Plan, reference to these documents while performing the Remedial Investigation and Feasibility Study for the South Cavalcade Street Site is essential. Additional work needed to prepare company and site-specific documents necessary to support the Work Plan and to perform the RI/FS work is detailed below. An example of these documents is provided in the accompanying Project Operations Plan prepared by Camp Dresser & McKee Inc.

4.1.3 SUBTASK 0A - PREPARE HEALTH AND SAFETY PLAN

Objective -- To prepare a site specific health and safety plan, or the equivalent, that shall govern all on-site activities at the South Cavalcade Street Site.

Methodology -- Based on an understanding of level and kinds of contamination at the South Cavalcade Street Site, a site specific health and safety plan should be formulated and submitted to EPA for review and comment prior to commencing any onsite work. At a minimum, this plan shall detail:

- Personnel protective equipment requirements keyed to generalized site localities and activities
- Required safety equipment onsite
- Personnel training requirements
- Medical surveillance program
- Personnel hygiene requirements
- Contingency plan and emergency procedures
- Site personnel activity safety monitoring program
- Decontamination procedures
- Responsibility for health and safety

- Standard operating procedures
- Site description
- Hazard evaluation
- Work limitations
- Emergency information
- Safety of nearby workers and residents

Deliverables -- A health and safety plan; see example provided.

4.1.4 SUBTASK 0B - PREPARE QUALITY ASSURANCE PLANS

Objective -- To prepare site-specific quality assurance and quality control plans that shall govern all work performed onsite and in the office for the RI/FS, including, but not limited to laboratory analyses, work performed by outside contractors, and data validation. The plans shall be developed in accordance with EPA's "Interim Guidelines and Specifications for Preparing Quality Assurance Project Management Plans."

Methodology -- Based on an understanding of the South Cavalcade Street Site, the RI/FS process, and the intent of accomplishing the Remedial Objectives, site-specific quality assurance and quality control plans shall be formulated and submitted to EPA for review and comment. It should be understood, that quality control refers to the procedures implemented to ensure ^{that} ~~the~~ ^{the} data collected are of the highest caliber, whereas quality assurance refers to the set of independent checks and verifications that the quality control procedures have been implemented and are functioning. Quality control includes such things as instrument calibration and maintenance procedures and data recording and gathering format. Quality assurance includes use of duplicates, spikes, and trip blanks, data validation, and other internal audit procedures.

Deliverables -- A quality assurance plan and a quality control plan for the South Cavalcade Street Site; see example provided.

4.1.5 SUBTASK 0C - FIELD SAMPLING AND ANALYTICAL PLAN

Objective -- To prepare a site-specific sampling and analyses plan that details all sampling and analytical requirements and procedures for performing the RI/FS at the South Cavalcade Street Site.

Methodology -- A site-specific field sampling and analyses plan shall be formulated and submitted to EPA for review and comment. The field sampling and analytical plan shall be the controlling document for all sampling and analyses performed onsite work at the South Cavalcade Street Site and all laboratory analyses. At a minimum this plan shall detail:

- The kinds of samples that will be taken; in ~~strict~~ ^{SRL 3/25/85} accordance with this Work Plan
- The locations at which all samples are to be obtained; in ~~strict~~ ^{SRL 3/25/85} accordance with this Work Plan
- Sample numbers
- Sampling techniques and protocols
- Quantities required for specific analyses
- Field handling procedures
- Field tests to be performed, including procedures and the equipment to be used
- Data entry requirements
- Sampling team members and responsibilities
- Sample packaging, marking, and shipping requirements
- The name, address, telephone number, and contact at the analytical laboratory
- Analytical procedures to be used
- Data reporting requirements

Deliverables -- A site-specific field and analytical plan; see example provided.

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4.1.6 SUBTASK 0D - PREPARE SITE MANAGEMENT PLAN

Objective -- To prepare a site-specific management plan governing all operations at the site, including site access, site security, contingency plans for other than site personnel, and the general coordination of all activities planned for the site.

Methodology -- A site-specific site management plan shall be prepared for the South Cavalcade Street Site, and submitted to EPA for review and comment. The plan shall govern activities on the site, access to the site, disposal or decontamination of field equipment, and site security and shall include contingency plans to deal with non-site personnel.

Deliverables -- A site management plan; see example provided.

The above described plans may be completed as separate, individual plans or as a set of plans encompassed by a single document. Should a single document be prepared, the components that would be the equivalent of the above plans must be clearly evident.

4.2 REMEDIAL INVESTIGATION

4.2.1 OBJECTIVE

The primary objective of the Remedial Investigation is to characterize the South Cavalcade Street Site in terms of the nature and extent of contamination at the site and its threat to human health, welfare and the environment. A second objective of the Remedial Investigation is to obtain the requisite information for performing a Feasibility Study to ascertain the most feasible methods to remediate the threats to public health and safety and the environment, in accordance with the National Contingency Plan. The background of the site--its location and history of use and the nature and extent of the problem--has been summarized in Section 2 of this Work Plan and are described more fully in the Interim Site Characterization Report for the South Cavalcade Street Site. The accompanying Site Plans provide additional relevant information with respect to the location of current

facilities on the site, facilities related to the wood treating and preserving activities that formerly occurred on the site, and proposed sampling localities. All tasks of the Remedial Investigation are to be performed as described below and in accordance with Koppers' Project Operations Plan for the South Cavalcade Street Site or an equivalent set of plans.

4.2.2 TASK 1 - COLLECTION OF ADDITIONAL BACKGROUND INFORMATION

SUBTASK 1A - REVIEW KOPPERS COMPANY FILES AND INTERVIEW FORMER EMPLOYEES

Objective -- To obtain all possible information relating to past operations by Koppers Company and its predecessor National Creosote and Lumber Company at the South Cavalcade Street Site. This information might include further documentation of the processes that were used, waste disposal practices, spills that were used, and the locations of important facilities. Historic site plans and maps would be particularly useful.

Methodology - Careful review of Koppers Company files and archival data; interviews with current and past employees of Koppers Company and its predecessor, National Creosote and Lumber Company, who might have information pertinent to the facilities and the operations at the South Cavalcade Street Site.

Deliverables -- Addenda to the previously prepared Site Plans and Interim Site Characterization Report.

SUBTASK 1B - AERIAL PHOTO EVALUATION

Objective -- To evaluate historic aerial photos to document the kinds and locations of wood treating and wood preservation operations that have occurred on the South Cavalcade Street Site.

Methodology -- Review and interpret available aerial photography for the South Cavalcade Street Site. A preliminary listing of sources, vintages, scales, is contained in Table 4-1. Interpretation using stereo pairs may

TABLE 4-1
HISTORICAL AERIAL PHOTOGRAPH COVERAGE FOR
SOUTH CAVALCADE SITE, HARRIS COUNTY, TEXAS

Comment	Year	Agency	Scale	Photo No.	Cost	Total
B & W	1930	Tobin	1" = 1500'		\$50 first photo \$25 @ add. photo per roll	
B & W	1935	Houston Pub. Lib.	1:24,000			
B & W	1938	Nat'l. Archives (ASCS)	1:20,000	BQY 5, 4, 3, 2, 1	\$3.00 ea.	\$15.00
Unavailable	1938	Texas Petroleum Information Ctr.	1:20,000			
B & W	1944	ASCS	1:20,000	BQY-4C 144, 143, 142	3.00 ea.	9.00
B & W	1945	Houston Pub. Lib.	1:18,000			
B & W	1952	Houston Pub. Lib.	1:20,000			
B & W	1953	ASCS	1:20,000	BQY-13M 86, 87, 88	3.00 ea.	9.00
B & W	1955	Houston Pub. Lib.	1:20,000			
B & W	1956	Tobin	1"=6300'			
B & W	1956	Texas Petroleum Information Ctr.	1:2500			
B & W	1957	ASCS	1:20,000	BQY-4T 135, 136, 137	3.00 ea.	9.00
B & W	1964	ASCS	1:20,000	BQY-3FF 144, 145, 146, 147	3.00 ea.	12.00
B & W	1965	Houston Pub. Lib.	1:12,000			
B & W	1966	USGS	1:21,314		5.00 ea.	
B & W	1971	Adams Aerial Survey	1:36,000		15.00 ea.	
B & W	1972	Adams Aerial Survey	1:36,000		15.00 ea.	
B & W	1973	ASCS	1:40,000	A40-48201-173, 199, 200	3.00 ea.	9.00
B & W	1974	Adams Aerial Survey	1:36,000		15.00	
B & W	1975	Houston Pub. Lib.	1:12,000			
B & W	1975	Tex. Highway Dept.	1:12,000			

*More recent photos available, but probably unimportant.

provide the best approximation of the facilities and plant layout at the time the photographs were taken. Compositing enlargements may then be used to generate a series of overlays that include, among other things, delineation of areas where contaminated soils are potentially present, either because staining is visible on the photographs or because the facilities and the structures observed are those where, through use, contamination might occur.

Deliverables -- Addenda to the Site Plans and the Interim Site Characterization Report.

SUBTASK 1C - SITE SURVEY

Objective -- To produce a survey of the South Cavalcade Street Site that accurately delineates the current topography, using a one-foot contour interval, site boundaries, and existing features; buildings, paved areas, storage tanks, rail lines, loading docks, waste piles, observation wells, etc. The occurrence of above and below ground utilities on and adjacent to the site should also be determined and plotted on the survey. The topographic survey may ultimately become the base map on which all areal information obtained in further Remedial Investigation work is plotted.

Methodology -- The site survey may be produced using a combination of aerial photography, ground-surveying, and research of the local utility company files.

Deliverables -- A site survey, with topography, that can serve as the base map for plotting all areal information obtained in the future, and overlays depicting current facilities on the site and utilities on and adjacent to the site. These deliverables shall become addenda to the Interim Report on Existing Information and the Site Plans. The scale of the site survey shall be 1" = 100'.

SUBTASK 1D - WELL INVENTORY

Objective -- To document the occurrence of all current and historical municipal, industrial and domestic water wells, waste disposal wells, or oil or gas wells within two miles of the site.

Methodology -- Review and compile data from the records and publications of the Texas Department of Water Resources and the Texas Railroad Commission. Field verify the presence of these wells. In addition, inventory and field verify the presence of any wells for which there is no record with the public agencies that might occur within the equivalent of three city blocks of the current site boundary, or the limits of the contaminant plume, whichever is greater. Interviews with current and former employees of major companies and home owners in the area might be necessary.

Deliverables -- A detailed documentation, using maps, copies of public documents, and necessary narrative description, of the wells that occur in the vicinity of the site. Those for which there is a public record shall be field verified as to location, use, and condition within two miles of the site; those identified within the equivalent of three city blocks of the current site boundary, or the contaminant plume, may include those for which there is no public record.

4.2.3 TASK 2 - PERFORM FIELD INVESTIGATIONS

SUBTASK 2A - SURFACE WATER CHARACTERIZATION

Objective -- To obtain information on the quality of surface water runoff leaving the site, in puddles on or adjacent to the site, and in drainage ditches on and or adjacent to the site. Although past sampling at the South Cavalcade Street site suggests that contamination of surface water is not a problem, this should be verified with additional sampling. The surface water samples shall be analyzed for contaminants that might be incorporated into the water from past wood treating and preserving operations.

Methodology -- Runoff shall be sampled at least twice during the field program. In each of the sampling rounds, two samples shall be taken during the first flush, that is when runoff begins. One of the samples taken during the first flush should be a sample only of the water, that is without sediment or surface film. The other sample should include the surface film. If no surface film exists at the time of sampling, this sample may be omitted. All sampling equipment shall be properly cleaned prior to use or reuse.

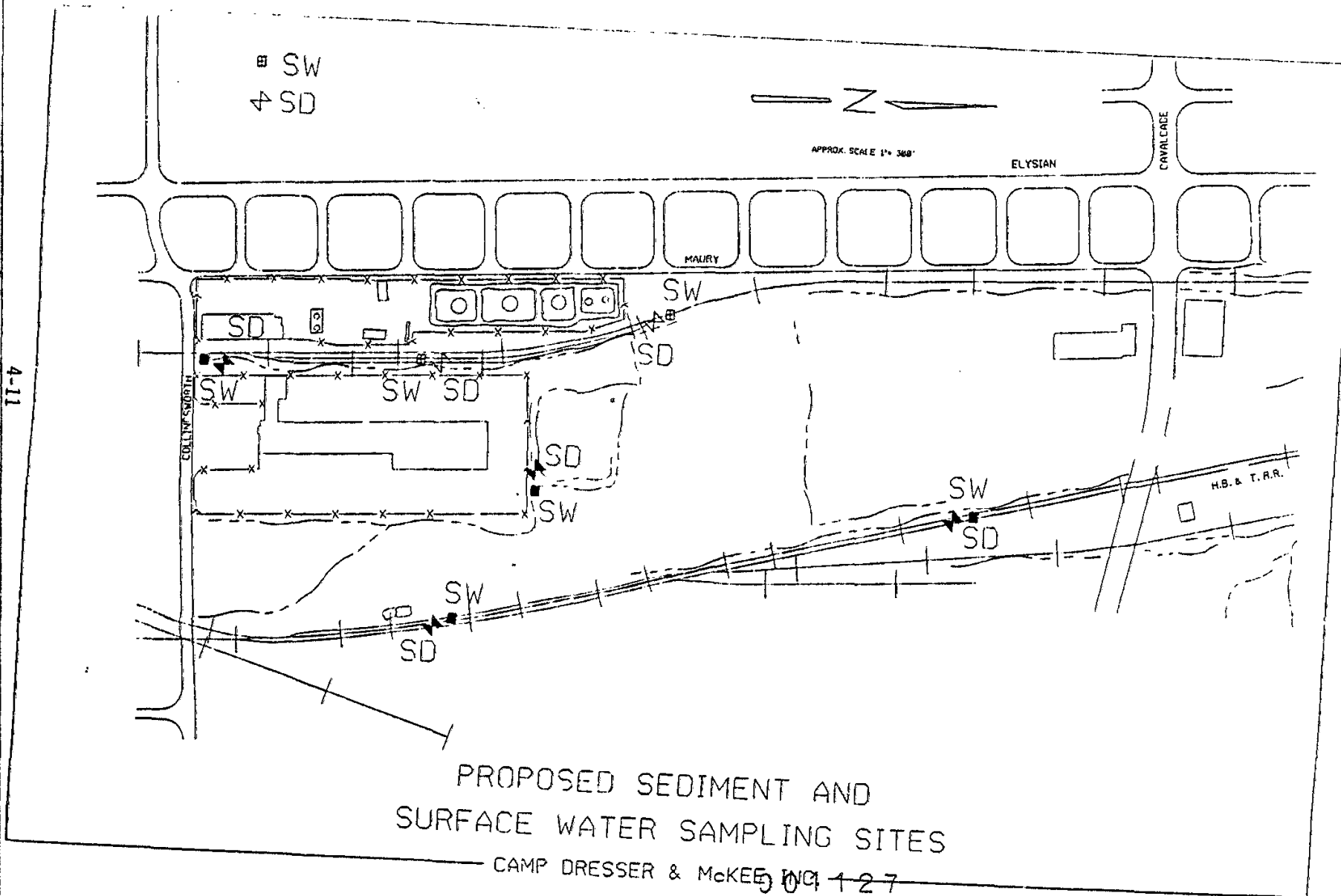
Sampling Locations -- Tentative surface water sampling locations are shown in Figure 4-1 and described below.

- 1) In the drainage ditch and catchment basins north and east of Meridian Fast Motor Freight Lines; one locality
- 2) In the drainage ditch on the east side of the site adjacent to the Houston Belt and Terminal railroad lines; two localities.
- 3) In the drainage ditch adjacent to the Missouri Pacific Railroad lines at the southwest corner of the Site where the ditch passes beneath Collingsworth Street.

The final selection of the locations for surface water sampling shall be made with the review and guidance of EPA after subtask 1C - Site Survey has been completed.

Analyses -- Analyses of first round surface water samples shall be for the following:

<u>Field Analyses</u>	<u>Method No.</u>
• pH	150.1
• Temperature	170.1
• Conductivity	120.1
• Dissolved oxygen	360.1/360.2
• Flow	



<u>Laboratory analyses^a</u>	<u>Method No.</u>
1) Volatile Organics; Library search ^b	624
2) Acids Fraction; Library search ^c	625
3) Bases/Neutrals; Library search ^c	625
4) Priority Pollutant Metals	200.2
5) Cyanide	335
6) Iron	236

Analyses of the samples containing the surface film shall be for Total Petroleum Hydrocarbons (EPA Method No. 418.1)^a only. *JRC 3/25/85*

^aAll laboratory analyses are to be performed by a laboratory experienced and equipped to handle high hazard materials.

^bThe library search is to identify up to 10 compounds with concentrations greater than 10 percent of internal standards.

^cThe library search is to identify up to 20 compounds with concentrations in excess of 10 percent of internal standards. *JRC 3/25/85*

For the second round of surface water samples, the field analyses will be conducted as noted above and the following modifications are permitted for the laboratory water sample analyses:

- 1) Volatile Organics; Library search^b -- Select one-third of samples
- 2) Iron -- Consult with EPA for approval to drop this analysis

Deliverables --

- 1) Results from field analyses
- 2) Results of laboratory analyses
- 3) Completed chain of custody forms
- 4) Memorandum describing field activities and documenting sample collection and sample techniques.

Contingency -- If the first round does not indicate contamination of the surface runoff from the site, the number and locations of the second round samples and the analyses performed shall be the same as the first round. If contamination of the surface water is detected in either round, EPA shall be consulted to devise a program to detect the source(s) and

significance of the contamination. In addition, should sampling and analyses of the shallow groundwater beneath and adjacent to the site reveal that the movement of contaminants to nearby drainage ditches and bayous is occurring or is likely to occur, additional surface water samples in those drainage ditches and bayous will be required. In all cases, review and guidance by EPA shall determine whether additional sampling shall be required.

SUBTASK 2B - SURFACE SEDIMENT CHARACTERIZATION

Objective -- To obtain information about the surface sediments that occur in drainage courses and other low lying areas on and adjacent to the South Cavalcade Street Site. Although past sampling suggests that contamination of the surface sediments in the drainage courses on and adjacent to the site is not a severe problem, this should be verified with additional sampling.

Methodology -- A single tube, shallow water sediment sampler may be used to collect the surface sediment samples. Samples should be collected during the surface water sampling, when the "first flush" sampling water samples are collected. Additional samples may be collected in other low-lying areas or drainage courses where no runoff is encountered during the sampling of the surface water. All sampling equipment shall be properly cleaned prior to use or reuse.

Sampling Locations -- Tentative surface sediment sampling locations are shown in Figure 4-1 and described below.

- 1) In the drainage ditch and catchment basins north and east of Meridian Fast Motor Freight Lines; one sample.
- 2) In the drainage ditch on the east side of the site adjacent to the Houston Belt and Terminal railroad lines; two sampling localities.
- 3) In the drainage ditch adjacent to the Missouri Pacific Railroad lines at the southwest corner of the site.

Analyses -- Analyses of the surface sediment samples shall be for the following:

Laboratory Analyses^a

Method No.

1) Volatile Organics; Library search ^b	8240
2) Acids; Library search ^c <i>Sec 3/25/61</i>	8250
3) Bases/Neutrals; Library search ^c	8250
4) Priority Pollutant Metals + Iron ^d	6010
5) Cyanide	9010
6) Arsenic	7061
7) Size Analysis	ASTM D-0422

Complete analyses, as described above, shall be performed on the first round of sediment samples. For the second round of sediment samples, the following modification is permitted for the sediment sample analyses:

- Volatile Organics; Library search^b -- Select one-third of samples

^aAll laboratory analyses are to be performed by a laboratory experienced and equipped to handle high hazard materials.

^bThe library search is to identify up to 10 compounds with concentrations greater than 10 percent of internal standards. *from the acid/base/neutral*

^cThe library search is to identify up to 20 compounds with concentrations greater than 10 percent of internal standards. *3/25/61*

^dIron may be deleted on the second round of sediment sampling with EPA approval.

Deliverables --

- 1) Results from analytical laboratory analysis
- 2) Completed chain of custody forms
- 3) Memorandum describing field activities and documenting sample collection and sampling techniques

Contingency -- Should extensive or severe levels of contamination be found in the surface sediments on or adjacent to the site, or should the results

of the two rounds of sampling of the surface sediments be in conflict, additional sampling shall be required to resolve the contradiction and, if necessary, to ascertain the sources of the contamination. In addition, should sampling and analyses of the shallow groundwater beneath and adjacent to the site reveal that movement of contaminants to nearby drainage ditches and bayous, then the sampling of surface sediments in those drainage ditches and bayous shall be required. Furthermore, if the analytical results indicate the presence of pentachlorophenol at concentrations greater than 1000 ppm, further field investigations should cease immediately, and the scope of work reevaluated and revised. In all cases, review and guidance by EPA shall determine whether additional sampling and analyses will be required.

SURTASK 2C - GEOPHYSICAL SURVEYING

Objective -- To survey the South Cavalcade Street Site using geophysical tools; surface resistivity, electromagnetics, ground penetrating radar, or some combination of the three. The purpose of the geophysical investigation is:

- 1) To employ a rapid, noninvasive investigative technique as a means of supplementing information obtained from bore holes.
- 2) To provide a means of correlating and filling information between existing bore holes.
- 3) To provide a means of better defining the configuration and attitude of important stratigraphic units beneath the site and in particular to identify subsurface irregularities in the shallow aquifer.
- 4) To provide a means of identifying concentrated accumulations of contaminants from the former wood preserving operations on the site, or any current operations on the site.

- 5) To provide information relative to altering or modifying the subsurface sampling program and the shallow well installation program described below.

Methodology - Because of the uncertainty as to whether geophysical techniques (i.e. resistivity, electromagnetics, and ground penetrating radar) will produce usable information at the South Cavalcade Street Site, the three techniques should be tested for utility and effectiveness. Based on current information, the test area should be relatively free of contaminants from the wood preserving operations that occurred there and at some distance from existing buildings, fences, power lines and the like. It is imperative to determine at the outset which, if any, of the geophysical tools can be employed.

Resistivity soundings should be performed first followed by testing of the electromagnetics and ground penetrating radar to arrive at the optimum combination that provides the best resolution; continuous profiling is desired. Should any, or some combination, of the geophysical techniques prove effective, a plan to investigate the rest of the site should be developed and submitted to EPA for review. In general, the initial profiles should be widely spaced, with infilling traverses established based on the results obtained, the ability to traverse the site with the particular geophysical tool being used, and other factors, as identified in the field. Onsite data processing capability will facilitate obtaining maximum benefit from the geophysical tools.

Sampling Localities -- To be determined in the field based on the criteria established in "Methodology."

Deliverables --

- 1) Contour and isopach maps and stratigraphic profiles of the soils materials of the shallow aquifer and the overlying materials.
- 2) Memorandum confirming or recommending alterations and modifications of the subsurface boring and well installation programs described below.

Contingency -- The geophysical investigation program described above is highly dependent on the success of the tests and the care with which the program is carried out. Addition of traverse lines may be desirable to better define subsurface and contaminant conditions at the site. The review and guidance of EPA with respect to the test results and the data gathered subsequently shall determine whether additional geophysical work should be carried out or whether further work may be eliminated.

SUBTASK 2D - SUBSURFACE SOIL SAMPLING

Objective -- To characterize the areal extent and depth of contamination in the subsurface soils on the South Cavalcade Street Site and the physical properties of the soil materials. Although the intent is to adequately characterize the entire site, emphasis in the subsurface sampling should be on those areas that are most likely to be contaminated.

Methodology -- Localities specified below for subsurface soils investigation should be investigated first with a portable power auger to ascertain the limits of soils contamination and to guide the placement of deeper subsurface borings. Materials brought up from depth with the power auger shall be visually described and tested for zinc, chromium, copper, and arsenic with a portable X-ray fluorescence machine or the equivalent, and for total hydrocarbon content or equivalent using both a flame ionization detector such as an OVA 128, or the equivalent, and an HNu with a lamp having the appropriate ionization potential. On the average, one sample from each power auger boring shall be tested for the above metals and total hydrocarbon content. All downhole equipment shall be properly cleaned between use. All materials removed from the holes shall be collected, containerized, and stored in compliance with RCRA regulations (no permit required) for proper disposal. The holes will be grouted back to the surface with a non-shrink bentonite-cement mix.

Continuous borehole samples shall be obtained using a combination of dry augering and either thin wall (Shelby tube) or split spoon samplers. At each sample locality, the sampler should be advanced either by pressing the sampler into the soil (thin wall) or by driving it downward (split spoon).

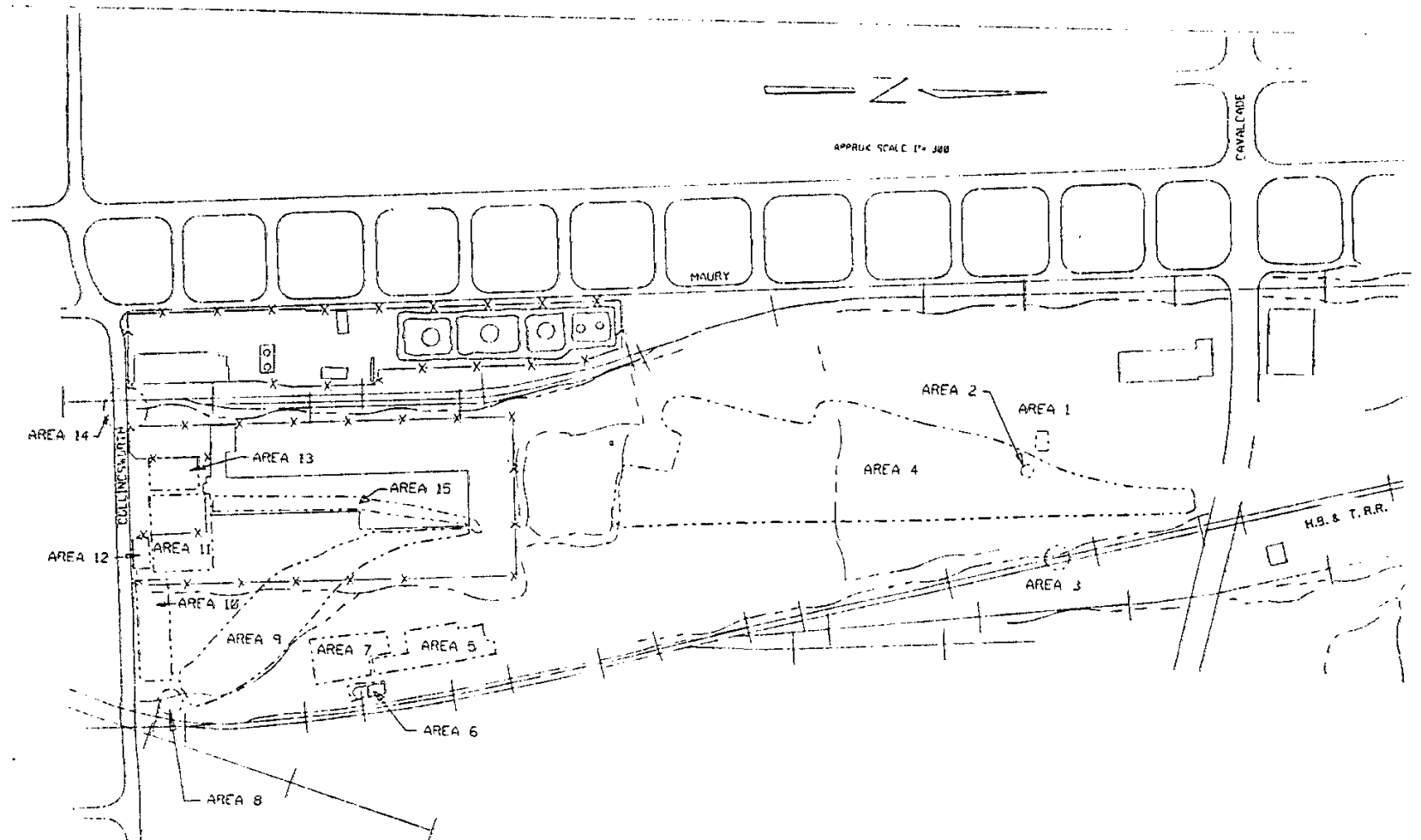
All samples shall be archived through
the Remedial Design Phase. RC 3/25/85

Upon removal from the ground, the samples should be checked for the emission of volatile organics. After extrusion or opening of the sample and a recheck for volatile emissions, the outer one-half inch and the disturbed ends of the sample should be trimmed, and the sample described, sectioned, and bottled for further analyses or storage, as appropriate. All downhole sampling equipment shall be cleaned prior to reuse; details of the sampling procedure are contained in the example Project Operations Plan. The boreholes are to be advanced to a minimum depth of five below the base of the shallow aquifer or until there is no overt contamination detected either visually, with the olfactory senses, or with field testing equipment. Approximately one half of the boreholes at any one sampling locality should be advanced to a minimum depth of 50 feet. All non-sample materials removed from the boreholes shall be collected, containerized, and stored in compliance with RCRA regulations (no permit required) for proper disposal. The boreholes shall be grouted back to the surface with non-shrink bentonite-cement mix as the augers are withdrawn from the hole.

Sampling localities -- Based on the examination of historic aerial photographs and previous data collected for the South Cavalcade Street Site, sampling localities have been primarily defined (Figure 4-2). These may be modified based on information obtained from Subtask 2C and where the presence of permanent structures impedes boring.

- 1) Area 1 -- In the vicinity of a lagoon identified in the northern part of the site. One borehole shall be advanced in the center of the suspected lagoon, a minimum of four boreholes shall be advanced around the indicated margins of the lagoon to better confirm its dimension and to ascertain the lateral and vertical extent of contamination.
- 2) Area 2 -- In the vicinity of a circular area to the southeast of the suspected lagoon, where some non-soil material is visible and little plant life occurs. One borehole shall be advanced in the center of the circular area a minimum of three boreholes shall be advanced outside of the circular area to better define the lateral and vertical extent of any contamination associated with this area.

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PROPOSED SUBSURFACE BORING AREAS

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- 3) Area 3 -- In the vicinity of CAV-OW-14, a shallow observation well on the east side of the tract in which overt contamination was noted during installation. A minimum of three boring shall be advanced in this area to ascertain the nature and the extent of the contamination. Some borings may need to be advanced outside of the site boundary along the H. B. & T. Railroad tracks.
- 4) Area 4 -- In an area in which treated lumber was commonly stored. A minimum of six borings shall be advanced in this area to ascertain the nature and extent of contamination.
- 5) Area 5 -- Beneath and around an old concrete loading dock that handled products from the tar refining plant. A minimum of five boreholes shall be advanced to ascertain whether spillage or leakage associated with the loading dock has contaminated the soils in the area.
- 6) Area 6 -- In the vicinity of two former spray ponds that were associated with the tar refining plant. Old plant drawings suggest that the ponds were constructed with concrete and measured 40' x 50' x 4.5' and 36.7' x 53.5' x 4.5'. Examination of a 1944 aerial photography, however, suggests that the pond to the south was of earthen construction at least at that time. A minimum of six boreholes shall be advanced to ascertain whether leakage associated with the former ponds has contaminated the underlying soils and to define the extent of potential contamination. Two of the boreholes shall be advanced within the area that the ponds once occupied; the remaining boreholes should be outside the former pond area.
- 7) Area 7 -- In the vicinity of the tanks and the main portion of the tar refinery on the east side of the site. At least one boring shall be advanced where each of the tanks (5), once stood or where overt contamination might be detected immediately outside of the footprints of the tanks, five additional borings should be advanced within and immediately adjacent to the footprint of the former tar processing plant.

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- 8) Area 8 -- In the vicinity of the southeast corner of the site. No analyses were performed on samples previously collected from this area, thus, further sampling is necessary. A minimum of two boreholes shall be advanced in this area, one of which may be off-site.
- 9) Area 9 -- In an area in which treated lumber was apparently commonly stored. A minimum of six borings shall be advanced in the area to determine the nature and extent of contamination.
- 10) Area 10 -- In the vicinity of the four large storage tanks that once occupied this area. One borehole shall be advanced where each of the tanks once stood or where overt contamination might be detected immediately outside of the tank footprint. Up to eight additional borings shall be advanced to ascertain the lateral and vertical extent of contamination that might have emanated from the tanks.
- 11) Area 11 -- In the vicinity of the old retort and the storage tanks that were once located in the southern part of the site. A rectangular sampling area that encompasses the locations of these former facilities should be established. Four borings shall be advanced at the corners of the sampling area; two should be advanced within the rectangular area.
- 12) Area 12 -- In the vicinity of an old cooling pond identified on a 1951 drawing of the wood treating and preserving facility. A minimum of three boreholes shall be advanced on the east, west, and south sides of the former pond to discern signs of any contamination that might be related to the former cooling pond and to determine the lateral and vertical extent of contamination.
- 13) Area 13 -- Within and immediately adjacent to a former structure labeled on the 1951 plan of the facility as "Treated Lumber Shed, Earthen Floor." A minimum of four borings shall be advanced within an immediately adjacent to the footprint of this structure, but

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outside of any existing structures on the site, to discern signs of contamination and, if any, to determine its areal and vertical extent.

14) Area 14 -- In the vicinity of the southwest corner of the site where overt contamination has been detected at the ground surface and in the groundwater in observation well CAV-OW-10. A minimum of four boreholes shall be excavated to determine the nature and the lateral and vertical extent of contamination detected in this area; two of these borings may be off-site.

15) Area 15 -- Along the drip tracks associated with the original creosoting plant and including the area in which treated lumber appears to have been stored. A minimum of four boreholes shall be advanced to ascertain the extent of contamination, if any, one of the borings should be outside of the indicated area of contamination.

16) In addition, a minimum of ten boreholes shall be advanced in the remaining areas of the site to ascertain whether additional areas of the site might be contaminated. In general, the boreholes should be advanced to allow relatively even coverage of the site. Specific localities should be selected, however, in response to:

- Information obtained from the review of Koppers Company files and interviews with current and former employees, described in Subtask 1A.
- Further information obtained from the interpretation of historic aerial photographs, described in Subtask 1B;
- Indications of soil contamination obtained during the geophysical investigation of the site, described in Subtask 2C;
- Evidence of overt contamination found in performing surface water, sediment and the subsurface sampling; or
- Any other indications of contamination at the site.

Analyses -- All samples obtained shall be screened visually, with the olfactory senses, and the OVA and HNu field instruments as described above. In addition, after the sample has been placed in a bottle for storage or further testing, a head space analysis shall be performed in the field under carefully controlled conditions (temperature, time). Selected samples shall be further screened by surrogate analysis for zinc, copper,

lead, chromium, and arsenic using a portable X-ray fluorescence machine, or the equivalent, and for total petroleum hydrocarbons using a modified EPA method 3540/418.1 (infrared spectrophotometer), or equivalent. At a minimum, this shall include samples from each distinct soils material encountered in the borehole; approximately four ^{Samples per 3/25/85} samples per boring on the average. From the samples subjected to the surrogate analysis, thirty samples or 15 percent (whichever is greater) shall also be analyzed for the following^a:

- 1) Acid and Base/Neutral Fraction Mix
(Capillary GC/MS; Method No. 8270); Library Search^b ON
M
1
JRC 3/25/85
- 2) Metals; iron, zinc, copper, chromium, lead, arsenic (Method No. 6010) O
O
- 3) Cyanide, (Method No. 9010) JRC 3/25/85

^aAll laboratory analyses are to be performed by a laboratory experienced and equipped to handle high hazard materials. JRC 3/25/85
^bThe library search is to identify up to 20 ~~30~~ compounds with concentrations greater than 10 percent of internal standards.

These samples shall be fully representative of the contaminated and uncontaminated soils encountered on the site.

Finally, should highly contaminated soils (containing relatively pure product) be encountered in Area 1 or elsewhere on the site, up to 3 samples per area shall be subjected to laboratory analysis of the following parameters:

<u>Laboratory Analyses^a</u>	<u>Method No.</u>
1) Volatile Organics; Library search ^b	8240
2) Acid Fraction; Library search ^b <i>✓ c</i> <i>SPC 3/25/85</i>	8250
3) Bases/Neutrals; Library search ^c	8250
4) Priority Pollutant Metals + Iron	6010
5) Cyanide	9010
6) Arsenic	7061

^aAll laboratory analyses are to be performed by a laboratory experienced and equipped to handle high hazard materials.

^bThe library search is to identify up to 10 compounds with concentrations greater than 10 percent of internal standards. *from the acid/base/neutrals* *SPC 3/25/85*

^cThe library search to identify up to 20 compounds with concentrations greater than 10 percent of internal standards.

In addition to chemical analyses of samples obtained in the surface investigation, a selected number of samples that have no apparent contamination should be tested to ascertain their physical parameters in sufficient detail for engineering design purposes. Accuracy of visual, olfactory, and field tests should be determined prior to performing the geotechnical tests; thus samples for geotechnical testing should be collected and preserved in such a manner as to assure the validity of the test results. Geotechnical tests that should be performed include, but are not limited to:

Geotechnical Analyses

- Natural moisture content
- Unit dry weight
- Atterberg limits
- Passing 200 mesh sieve
- Unconfined compressive strength
(cohesive soils)
- Vertical permeability (clays or silty clays)

Deliverables --

- 1) Borehole Logs (Unified Soil Classification, at a minimum, but including blow counts, and static water levels in the boreholes)
- 2) Results of OVA, HNu, head space readings
- 3) Results of surrogate analyses
- 4) Results of laboratory analyses
- 5) Results of geotechnical analyses
- 6) Copies of the field notes of the supervising geologist or engineer

Contingency -- Should extensive or severe contamination of the subsurface soils on the site be indicated, but not adequately characterized by the above described subsurface investigation program, additional soil analyses, boreholes or trenches may be required. The required additional borings or trenches may be onsite or off-site. If the results of these analyses indicate the presence of pentachlorophenol at concentrations greater than 1000 ppm, further field investigations should cease immediately and the scope of work reevaluated and revised. In all cases, review and guidance by EPA shall determine whether additional laboratory analyses, boreholes, or trenches shall be required.

SUBTASK 2E - SHALLOW GROUNDWATER INVESTIGATION

Objective -- To obtain information on the hydrology and quality of shallow groundwater beneath and adjacent to the site and to determine if significant levels of contaminants are being transported off-site in the shallow groundwater. An auxiliary purpose of the shallow groundwater is to obtain additional information on the subsurface soils on the site. The shallow aquifer typically occurs at a depth of 10 to 20 feet below the ground surface.

Methodology --

Field Sampling and Analytical Plan JEC 3/25/85

A. Installation of Observation Wells: The observation wells shall be constructed, completed, and developed according to the detailed procedures contained in the ~~example Project Operations Plan~~. Briefly, the general installation procedure and characteristics of the observation well should be as follows:

Observation wells in the shallow aquifer shall be drilled using a combination of split spoon or Shelby tube sampling and dry hollow-stem augering technique. The depth of the wells shall be governed by the stratigraphy beneath the site, established by the subsurface boring program. Continuous soil samples shall be taken to a depth of two feet below the base of the shallow aquifer, described, tested in the field (including head space analyses), and preserved as described in Subtask 2D for the subsurface investigation. All downhole equipment shall be steam-cleaned prior to commencing drilling at each hole; all sampling equipment shall be properly cleaned prior to reuse. All nonsample materials removed from the well shall be collected, containerized, and stored in compliance with RCRA regulations (no permit required) for proper disposal.

The observation wells may be either 2 inch or 1-1/2 inch, flush-joint, Schedule 40 PVC, with manufactured PVC screens. All joints must be screw threaded or riveted; no solvent welded joints are permitted. The well screens shall have 0.010 inch openings and be of sufficient length to screen the entire thickness of the shallow aquifer and two feet above the indicated water table. The well screen and casing shall be thoroughly cleaned prior to installation.

The well screen and casing shall be installed through the hollow stem of the auger. The entire length of the well screen to two feet above the top of the well screen (if possible) shall be packed with an appropriate sized material to facilitate hydraulic communication of the well with the adjacent aquifer and to minimize clogging. The pack material should be installed as the augers are withdrawn from the well bore. Use of 1-1/2 inch PVC rather than 2 inch PVC facilitates placement of pack material, while

should be measured each time the water levels are measured. All downhole measuring equipment should be properly cleaned prior to reuse.

C. Groundwater Sampling: The groundwater in all 14 newly installed onsite and off-site observation wells and 8 existing onsite observation wells shall be sampled for chemical analyses approximately four weeks after the new wells have been installed and again approximately three months later. Three to ten casing volumes shall be purged from each well, using a bailer, peristaltic pump, or other appropriate means, prior to removing the sample of record. Water produced during the purging operation shall be collected, ^{in accordance with RCRA (no permit required) JRC 3/25/85} and stored for proper disposal. Should an observation well fail to yield the required quality of water during purging, the well should be bailed or pumped dry and the sample obtained as soon as there is sufficient water in the well for the required sample volume. Details of the sampling procedure are described in the example Project Operations Plan. Two rounds of sampling shall be deemed sufficient, should the analytical results be consistent. If inconsistencies develop, a third round of sampling shall be required.

D. Aquifer Properties: Aquifer properties in the shallow aquifer shall be determined using selected observation wells, which, based on one or more rounds of water quality analyses, appear to be relatively free of contamination. A modified slug or falling-head permeable test is envisioned, but other suitable testing procedures may be substituted, provided that they do not lead to significant discharges from the wells. Any water removed from the wells shall be collected ^{in accordance with RCRA (no permit required) JRC 3/25/85} and stored for proper disposal. Aquifer tests should be performed at approximately five wells.

Sampling Localities -- 14 localities onsite and off-site have been preliminarily selected for installation of new observation wells into the shallow aquifer (Figure 4-3). The localities were selected based on available hydrologic and water quality data for the shallow aquifer. The wells are intended to better define the configuration of the water table in the shallow aquifer and to document extent of groundwater contamination beneath the South Cavalcade Street Site and its migration from the site. Alternate localities may be selected based on:

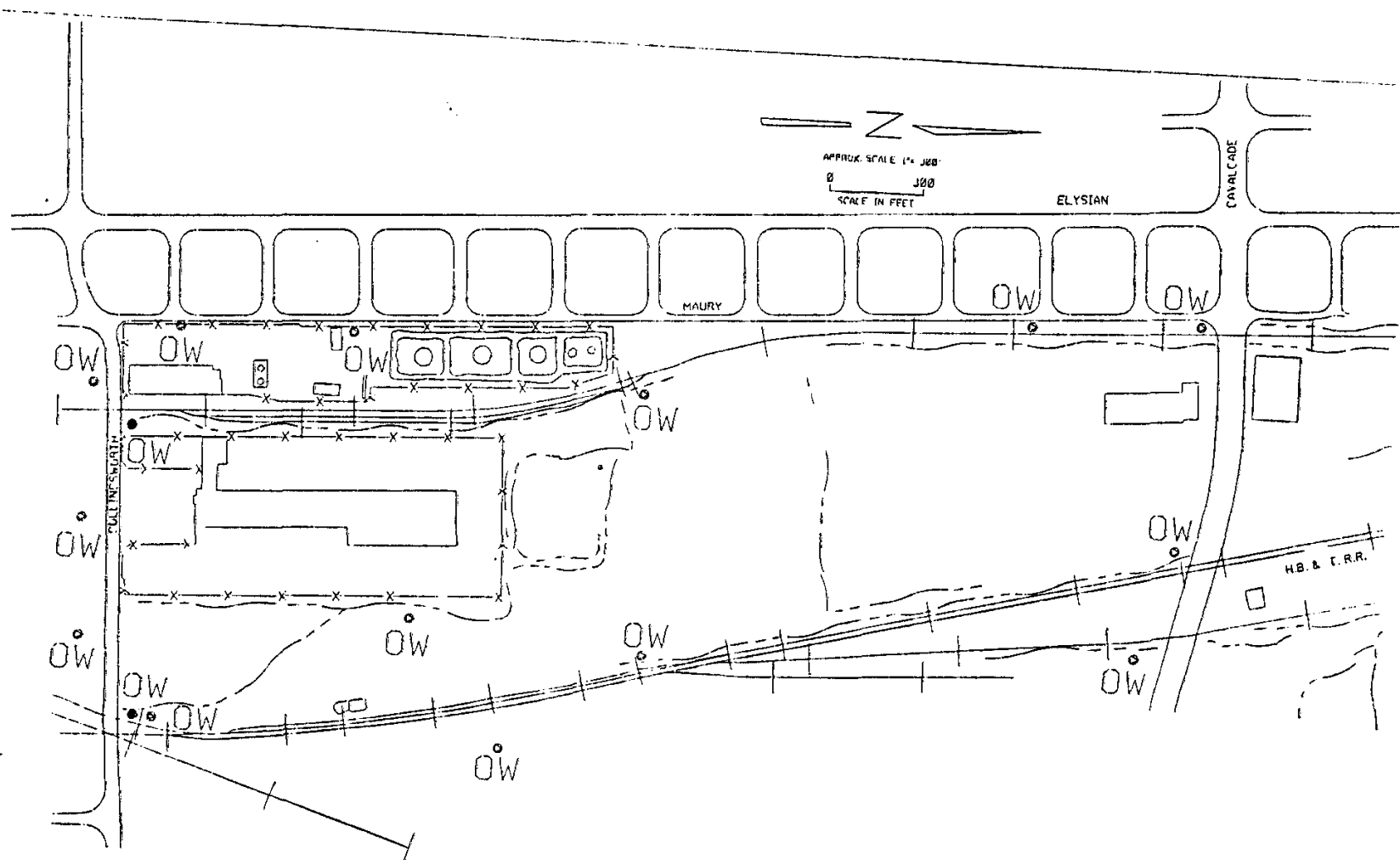
minimizing clogging or bridging. Approximately two feet of pure, high sodium bentonite shall be placed above the pack material, and the remainder of the well bore grouted back to the surface with a non-shrink bentonite-cement grout. Each well shall be adequately protected with a lockable steel casing, concrete pad, and cement-filled steel barriers as described in the example Project Operations Plan. The proper identification code of the observation well shall be permanently affixed to the protective casing.

The observation wells shall be developed to as sediment-free as possible condition using air lifting or other appropriate techniques. Development shall proceed for a minimum of 30 minutes or 5 casing volumes, ^{or 30/60} whichever takes longer. A sediment-free condition shall then be defined as less than 0.01 ml of sand collected in a 1000 ml Imhoff cone when sampled 1 to 2 minutes after start of pumping or a total maximum development time of 2 hours, excluding any non-pumping or developing intervals longer than 15 minutes.

All water produced during development of the wells shall be collected, containerized, and stored in accordance with RCRA regulations (no permit needed) for proper disposal. The location of the wells shall be surveyed to the nearest 0.01 foot. The ground surface at the well and casing stick up shall be surveyed to the nearest 0.1 foot, and a permanent mark affixed to the casing for subsequent consistent measurement of water levels.

8. Water Level Measurements: Measurement of water levels in the fourteen new observation wells and the eight existing observation wells shall be made no sooner than one week nor more than one month after installation of the new wells. Thereafter, water levels in all observation wells shall be measured at least quarterly for a period of one year and whenever samples are taken for water quality analyses. In addition, water levels should be measured on a frequent basis (daily to weekly) following at least one period of wetter than normal weather to detect whether individual recharge events directly influence water levels in the shallow aquifer. To the extent possible, whenever water level measurements are made, all measurement should be completed on the same day, the total depth of the well

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PROPOSED OBSERVATION WELL LOCATIONS

CAMP DRESSER & McKEE 01145

- Information obtained from review of Koppers Company files and interviews with current and former employees, described in Subtask 1A;
- Further information obtained from the interpretation of historic aerial photographs, described in Subtask 1B;
- The geophysical investigation, described in Subtask 2C;
- Other indications of contamination at the site or conflicts with the localities selected.

Analyses -- Analyses of the first round of shallow groundwater samples from the fourteen newly installed wells and the eight existing onsite wells shall be for the following:

<u>Field Analyses</u>	<u>Method No.</u>
1) pH	150.1
2) Conductivity	120.1
3) Temperature	170.1

<u>Laboratory Analyses^a</u>	<u>Method No.</u>
1) Volatile Organics; Library search ^b	624
2) Acids Fraction; Library search ^c <i>REC 3/25/85</i>	625
3) Bases/Neutrals; Library search ^c	625
4) Priority Pollutant Metals	200.2
5) Cyanide	335
6) Iron	236
7) Nitrate	300
8) Pesticides & PCB's	608

^aAll laboratory analyses are to be performed by a laboratory experienced and equipped to handle high hazard materials.

^bThe library search is to identify up to 10 compounds with concentrations greater than 10 percent of internal standards.

^cThe library search is to identify up to 20 compounds *with* from the acid/base/neutral *REC 3/25/85*
with concentrations greater than 10 percent of internal standards.

The analysis of the 22 shallow groundwater samples collected during the second round may be modified as follows:

- 1) Volatile Organics; Library search^b - select one-third of samples collected
- 2) Acids Fraction; Library search^c *REC 3/25/85*

- 3) Bases/Neutrals; Library search^e
- 4) Priority Pollutant Metals - select one-third of samples collected
- 5) Copper, chrome, zinc and arsenic remaining two-thirds of samples collected
- 6) Iron - consult with EPA
- 7) Pesticides and PCB's - select one-third of samples collected

^bThe library search is to identify up to 10 compounds with concentrations greater than 10 percent of the internal standards

^dThe library search to identify up to 10 compounds with concentrations greater than 10 percent of the internal standards can be limited to a select one-third of the samples

^eThe library search to identify up to 20 compounds with concentrations greater than 10 percent of the internal standards can be limited to a select one-third of the samples.

From the acid/base/neutral SRC 3/25/85

If further sampling is required after two rounds due to inconsistencies between the first two rounds, then selected parameters may be eliminated from the analysis with EPA approval.

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Deliverables --

- 1) Well logs and completion records for all newly installed observation wells
- 2) Documentation of the volume and disposition of all water and residual soils materials removed from the wells
- 3) Copies of the field notebook of the supervising geologist or engineer
- 4) All water level measurements and interpretations of the configuration of the water table in the shallow aquifer
- 5) Field analysis results
- 6) Analytical laboratory results

7) Copies of the chain of custody forms

8) Raw data and results of all aquifer tests

Contingency -- Should extensive or severe levels of contamination be found in the shallow aquifer beneath the site, leaving or having the potential to leave the confines of the site, or in areas adjacent to the site, installation of additional observation wells shall be required to ascertain the extent, concentrations, and rate of migration of the contaminants. Monitoring beyond the one year specified above may also be required. In all cases, the review and guidance of EPA shall determine whether additional wells, or additional groundwater samples, or analysis for additional quality parameters are necessary.

SUBTASK 2E - DEEPER GROUNDWATER INVESTIGATION

Objective -- To determine whether contaminants related to past and current activities on the South Cavalcade Street Site have affected the quality of groundwater in the deeper aquifer, considered here to be the aquifer occurring approximately 200 feet below the ground surface, and, if necessary, to investigate the hydrology of the deeper aquifer system.

Methodology --

A. Installation of Observation Wells: Observation wells installed into the deeper aquifer should be constructed and completed as described in the ~~example Project Operations Plan~~. To minimize the possibility of inadvertently contaminating the deeper aquifer when the well is installed, a telescoping procedure shall be employed. Briefly, the installation procedures and characteristics of the wells should be as follows.

The well bore should be advanced initially through the shallow aquifer using mud rotary techniques until "clean" materials are encountered in the underlying formation. The underlying formation may be assumed to be clean if no indications of the contamination are detected through visual examination of the soils, with the olfactory senses, or with field instruments. A

Field Sampling and
isotopic Plan
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sample from the terminus of this initial boring shall be analyzed in the laboratory to confirm that it was free of contamination.

The well bore should then be sealed off with a large diameter (6 inches or more) steel casing cemented into place with non-shrink, bentonite cement grout. Once the grout has set (24 hour minimum) and the well bore inside the surface casing has been thoroughly cleaned, the well bore should be advanced further employing a pure, high sodium bentonite mud of sufficient consistency and weight (approximately 120 percent the density of water) to ensure that its density is greater than the density of any known contaminants at the South Cavalcade Street Site. Frequent mud changes and cleaning of the downhole equipment will further minimize the potential for inadvertently transporting contaminants downward. Soil samples should be collected at 5 foot intervals to 50 feet, at 10 foot intervals thereafter, and at each change in materials; all samples shall be handled and stored as described in Subtask 2D including headspace analyses and other testing in the field and laboratory. Samples of the material immediately above, within, and immediately below the target horizon shall be analyzed in the laboratory to confirm field ^{observations per 3/25/85} ~~testing results~~. The surface casing may also function as the protective casing for the well.

The well casing and screen shall have a minimum nominal diameter of four inches and shall be constructed of Schedule 80 PVC or fiberglass. The screen shall be factory manufactured, with openings of 0.010 inches. All joints shall be screw threaded or riveted; no welded joints may be used. The well casing and screen shall be thoroughly steam cleaned prior to installation.

The entire interval of the deeper aquifer shall be screened. The screened interval of the well, to two feet above the top of screen, shall be packed with clean, suitably graded material to facilitate hydraulic communication between the well and the formation and to prevent clogging of the well screen with fine particles. A five foot bentonite seal shall be placed above the screen pack and the remainder of the borehole, to the ground surface, grouted with non-shrink bentonite cement grout. All drilling mud and cuttings shall be collected, containerized, and stored in compliance

with RCRA (no permit required) for disposal onsite or at an approved facility.

Upon completion, and after the grout has been allowed to cure for a minimum of 24 hours, the well shall be developed to a sediment-free condition using a combination of air lifting, surge blocking, and pumping techniques. A sediment-free condition shall be defined as not more than 0.01 ml of sand collected in a 1000 ml Imhoff cone when sampling 1 to 2 minutes after pumping commences. The maximum total development time shall be 10 hours, excluding nonpumping or nondeveloping intervals longer than 15 minutes. Once free of apparent sediment, the well shall be pumped for a minimum of eight hours at 10 gallons per minute, or the equivalent volume of water. Water produced by completion or purging must be collected, containerized, and stored in compliance with RCRA (no permit required) for proper disposal.

B. Water Level Measurements: Measurement of water levels in the deeper aquifer shall be made no sooner than one week nor more than one month after installation of the wells. Thereafter, water levels in the wells should be measured on a quarterly basis and at each time samples are obtained for analyses of water quality. All downhole measuring equipment shall be properly cleaned prior to use.

C. Groundwater Sampling: The groundwater in the deeper aquifer shall be sampled approximately one month after installation of the wells and again approximately three months later. Prior to sampling, a minimum of ten casing volumes of groundwater shall be removed from the well; this shall be stored and disposed of as previously described.

Sampling Localities -- Based on available information, installation of two deep wells into the deeper aquifer in the southeast and southwest corners of the site are considered adequate (Figure 4-3). These wells, in addition to the existing well in the northern portion of the site, should be sufficient to confirm the quality of water in the deeper aquifer and to provide a basis for determining whether additional wells are needed. These

wells may not be sufficient to allow determination of the basic hydrology of the deeper aquifer, however.

Analyses --

Analyses of groundwater samples from the deeper aquifer shall be for the following:

<u>Field Analyses</u>	<u>Method No.</u>
1) pH	150.1
2) Conductivity	120.1
3) Temperature	170.1

<u>Laboratory Analyses^a</u>	<u>Method No.</u>
1) Volatile Organics; Library search ^b	624
2) Acids Fraction; Library search ^c	625
3) Bases/Neutrals; Library search ^c	625
4) Priority Pollutant Metals	200.2
5) Cyanide	335
6) Iron	236
7) Nitrate	300
8) Pesticides and PCB's	608

^aAll laboratory analyses are to be performed by a laboratory experienced and equipped to handle high hazard materials.

^bThe library search is to identify up to 10 compounds with concentrations greater than 10 percent of internal standards.

^cThe library search is to identify up to 20 compounds ~~with~~ ^{from the acid/base/neutrals} concentrations greater than 10 percent of internal standards. gpc 3/25/85

gpc 3/25/85

Complete analyses, as described above, shall be performed on the first round of deep groundwater samples. For the second round, the only changes permitted are elimination of the analyses for nitrate and iron, with EPA approval.

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Analyses of the ^{selected} soil samples shall be for the following:

Laboratory Analyses^a

Method No.

- | | |
|---|------|
| 1) Acids and Base/Neutral Fraction Mix
(Capillary GC/MS) | 8270 |
| 2) Zinc, copper, chromium, lead | 6010 |
| 3) Arsenic | 7061 |
| 4) Cyanide | 9010 |

^aAll laboratory analyses are to be performed by a laboratory experienced and equipped to handle high hazard materials.

If further groundwater sampling is required after two rounds, selected parameters may be eliminated from the analyses with EPA approval.

Deliverables --

- 1) Well logs and completion records for the wells into the deeper aquifer
- 2) Documentation of the disposition of all water produced during development and sampling of the deeper wells
- 3) Copies of the field notebook of the supervising geologist or engineer
- 4) Field analyses results
- 5) Analytical laboratory results
- 6) Copies of the chain of custody forms

Contingency -- Should contamination of the deeper aquifer be found, installation of one or more additional wells shall be required, as shall determination of the fundamental hydrologic behavior of the deeper aquifer system. In addition, installation of one or more wells to the next deeper aquifer may be required, as well as documentation of its use, hydrology, and quality. Monitoring beyond the one year period specified above may also be required. Furthermore, if the analytical results of soils materials indicate the presence of pentachlorophenol at concentrations greater than 1000 ppm, further field investigations should cease immediately, and the scope of work reevaluated and revised. In all cases, the review and guidance of EPA shall determine whether additional sampling, additional wells, additional analyses, or monitoring over a more extended period shall be required.

SUBTASK 2F - NONSOIL MATERIALS INVESTIGATION

Objectives -- To determine the character and degree of contamination, if any, of non-soil material encountered on the South Cavalcade Street Site to facilitate evaluation of the disposition of these materials.

Methodology -- Non-soil materials encountered on the South Cavalcade Street Site that are related to past wood treating and wood preserving operations on the site or that appear to be abandoned and not directly under the control of or attributable to the current land owners shall be examined, characterized and sampled for indications of contamination using appropriate techniques.

Sampling Localities -- No specific sampling localities have been identified. The need to perform this subtask is dependent on the results of the previously performed Field Investigation subtasks.

Analyses -- Analyses of non-soil materials shall be sufficient to determine the nature and the extent of their contamination and to assess the most feasible method of disposing of the materials. Engineering judgment is necessary in selecting the tests and analyses to be performed.

Deliverables --

- 1) Complete descriptions of all non-soil materials encountered on the site
- 2) A map depicting the locations and extent of non-soil material encountered on the site
- 3) Analytical laboratory results
- 4) Copies of the field notes of the supervising geologist or engineer
- 5) Copies of the chain of custody forms

Contingency -- The review and guidance of EPA is essential in addressing the occurrence and contamination of non-soil materials encountered on the South Cavalcade Street Site. Consultation with EPA is required in assessing what tests are necessary and whether exploration to completely determine the extent and degree of contamination of non-soil materials is necessary. If the analytical results indicate the presence of pentachlorophenol at concentrations greater than 1000 ppm, further field investigations should cease immediately, and the scope of work reevaluated and revised with EPA guidance.

SUBTASK 2G - AIR QUALITY INVESTIGATION

Objectives -- To ascertain whether air emissions associated with contamination on the South Cavalcade Street Site pose a hazard, either in their current state on the site, or in the event of their removal.

Methodology -- Air quality analyses shall be a routine part of all invasive field investigations (Subtasks 2B, 2D, 2E, and 2F) through use of field monitoring instruments. These analyses should assist in characterization of the air emissions at the South Cavalcade Street Site and in assessing whether removal of the contaminants on the site would constitute a hazard. Background air quality may be obtained using Tennax tube samplers for volatile organics. Samples should be collected over a two-hour time interval on three consecutive days. On each day, one upwind sample and two downwind samples should be collected. All samples shall be collected in duplicate.

Analyses -- Thermal desorption (GC/MS) for volatile organics; procedure is not EPA approved, but EPA development documents are available.

Deliverables --

- 1) Laboratory analyses
- 2) Chain of custody forms
- 3) Memorandum describing collection procedures and sampling localities and sampling times.

Contingency -- Should severe and extensive air emission hazards be encountered on the South Cavalcade Street Site, additional air quality studies shall be necessary. These might include, but not necessarily be limited to, installation of one or more air quality sampling stations and excavation of test pits for the purposes of investigating the emissions that might occur if soil or non-soil contaminants are removed.

4.2.4 TASK 3 - PERFORM ENDANGERMENT ASSESSMENT

Objective -- To conduct an endangerment assessment to establish the extent to which contaminants present at the site or released from the site may present a danger to the public health, welfare, or the environment. The endangerment assessment should evaluate conditions at the site in the absence of any further remedial actions, i.e., it will constitute an assessment of the "No-Action" remedial alternative. The endangerment assessment shall be conducted consistent with the EPA draft guidelines and will be detailed enough to conform at least to EPA's "Level II" Endangerment Assessment.

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Methodology -- The following factors shall be ^{QPL 3/25/85} ~~will~~ be considered through the performance of eight subtasks:

- Determine contaminants found at the site
- Ascertain factors affecting migration
- Assess environmental factors
- Evaluate exposure
- Evaluate toxicity
- Determine environmental impacts
- Determine data gaps and recommendations
- Quality assurance

SUBTASK 3A - DETERMINE CONTAMINANTS FOUND AT THE SITE

Information on the identity, quantity, form, and concentrations of contaminants found at the site should be summarized in tabular and or graphic form and should be used as the basis for the transport and exposure models

outlined below. Specifically, data on source strengths and ambient concentrations in soil, groundwater, surface water, existing seeps, and air, should be summarized. Special attention should be paid to the reliability of analytical data, and the tabulations should ordinarily be limited to data validated by acceptable QA/QC procedures.

A short list of contaminants of primary concern for hazard evaluation should be compiled. This list should include, at a minimum, polynuclear aromatic hydrocarbons (PAH's), arsenic, chromium, lead, and zinc. Any other contaminants found at or near the site during the RI should be screened for inclusion in this list. In particular, if creosols and priority pollutant phenolic compounds are found at or near the site during the RI, these should be given special attention in screening. The screening of contaminants shall be based on quantities present, potential for exposure, and toxicity (using toxicity indices such as ambient water quality criteria or unit risks). This information should be used to derive a hazard index to permit comparison and ranking the relative hazards posed by each chemical found during the RI with those of PAH's and the metals listed above. Based on this ranking, a short list of contaminants of primary concern should be compiled and a preliminary report prepared for review by EPA and EPA's technical consultants. After approval of the short list by EPA, the remainder of the endangerment assessment may be limited to consideration of the chemicals on the short list.

SUBTASK 3B - ASCERTAIN FACTORS AFFECTING MIGRATION

Information on topography, soil environment, geological environment, hydrological characteristics, and climate generated during the RI should be summarized to serve as the basis of exposure models, as discussed below.

SUBTASK 3C - ASSESS ENVIRONMENTAL ^{FATE} ~~DATE~~ OF CONTAMINANTS

Physical and chemical characteristics of contaminants should be derived from standard sources and should be used to characterize the environmental persistence of each chemical, as well as its propensity to migrate in various media and to transfer from one medium to another. Specifically, a

detailed evaluation should be made of the persistence and mobility of PAH's in soils under the conditions prevailing at the site, including their tendency to be sorbed to soils and other materials present at the site, and their tendency to leach into groundwater. The last evaluation should take into account the presence of hydrocarbons, phenols or other solvents that may increase leachability. This evaluation should take into account, to the extent possible, differences in physical and chemical properties among different species of PAH's and should evaluate the potential for differential persistence or mobility of the more toxic species. A similar evaluation should be made of the mobility of compounds of arsenic, chromium, lead, and zinc (taking into account the chemical forms of these elements present at the site and prevailing conditions in soil and groundwater), and of any other contaminants included in the short list.

This information should be used to generate models of contaminant migration from the site. Specific routes of contamination that should be modeled are the following:

- 1) Leaching of contaminants into shallow groundwater aquifers, followed by transport in shallow groundwater to points where groundwater discharges to surface water or to areas where groundwater may be withdrawn for industrial use or other purposes.
- 2) Percolation of contaminants into deep groundwater.
- 3) If the result of No. 2 above, or monitoring of the deep groundwater indicate the potential for or actual transport of contaminants into the deep groundwater, the subsequent transport of contaminants in the deep aquifer should be modeled in detail, with the specific goal of predicting concentrations of contaminants at future time periods in areas where the aquifer is used for a drinking water supply.
- 4) Surface run-off or erosion of soil particles into surface water drainage.

- 5) If the results of No. 4 above, or sampling of bayous off-site indicate the potential for or actual transport of contaminants into off-site surface waters, the fate of the contaminants in these waters should be modeled. These models should take into account dilution, degradation, spatial dispersion, biological uptake, and bioconcentration in food chains.
6. Offsite transport of soils excavated during remedial actions and for the proposed Metro facilities.

Other routes of transport that should be considered to the extent necessary to evaluate their potential significance include volatilization of PAH's or other organic contaminants, transport of airborne dust, and off-site tracking of contaminated soils by vehicles, humans, or animals. These routes need not be modeled quantitatively if semi-quantitative calculations show them to be unimportant for exposure of sensitive receptors.

The objective of modeling contaminant transport is to derive estimates of ambient concentrations of contaminants both onsite and off-site and hence to estimate exposure by human and wildlife receptors. The modeling should therefore be focused on areas where potential receptors have been identified and need not attempt to generate a detailed description of the movement of low levels of contaminants into remote areas.

~~ENDANGERMENT ASSESSMENT~~

SUBTASK 3D - ~~EXPOSURE EVALUATION~~ JRC 3/25/81 original O.K.

~~Endangerment~~ JRC 10/2/85 original is O.K.

In the first stage in ~~exposure~~ Assessment, the populations at risk should be enumerated. For human populations, this should include a description of the number of distribution of residents and workers (both onsite and off-site), the demographic characteristics of the population, and projections for changes in future decades (obtainable from government and commercial sources). At the South Cavalcade Street Site, an evaluation should include the potential development of the site for a metro station and maintenance and storage yard. Use of the site by construction workers, future maintenance yard workers, and future Metro passengers should be summarized in detail. If transport of contaminants to deep groundwater is found likely

to occur, the extent of likely use of the aquifer for drinking or other purposes should be assessed. Any specially sensitive populations (children, older persons, etc.) should be identified. If off-site transport of contaminants is found likely to occur, wildlife populations at risk should be defined using information from governmental and private surveys, supplemented by focused field investigation if needed. EPA guidelines and current practices shall be followed in compiling and presenting this information.

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^{Stage} In the second ~~State~~ ^{Exposure} in ~~exposure~~ ^{JRC 3/25/85} Assessment, scenarios for exposure should be constructed. These scenarios should include at a minimum the following:

- Direct contact with contaminated surface soils by present or future users of the site;
- Direct contact with contaminated subsoils during future construction projects, including contact with such soils after their excavation and off-site or onsite disposal;
- Direct contact with contaminated surface soils following off-site transport by surface runoff, erosion, or tracking;
- Direct contact with contaminated shallow groundwater resulting from surface infiltration, industrial use, etc.
- Ingestion of contaminated drinking water from the deep aquifer;
- Consumption of contaminated fish or shellfish following runoff into neighboring bayous or other surface waters.

SUBTASK 3E - EVALUATE TOXICITY

A detailed summary of the toxicity of each of the contaminants on the short list should be prepared. These toxicity summaries should utilize the reviews in EPA's Ambient Water Quality Criteria (AWQC) documents published in 1980 as the initial basis for evaluation and should be supplemented with more recently-published information on toxicity and human health effects. For carcinogenic chemicals (including specifically PAH's, arsenic, and chromium), the toxicity summaries should refer to subsequent updated assessments by EPA's Carcinogen Assessment Group (CAG). Computerized literature searches should be conducted to identify any more recent studies that may require consideration and/or modification in hazard assessment.

Quantitative assessment of toxic hazards at predicted levels of exposure should follow current EPA procedures. For noncarcinogenic chemicals, exposure data should be compared to established "no-observed-adverse-effects-levels" (NOAELs) to estimate margins-of-safety. For carcinogens, exposure data should be combined with estimates of "unit risks," which are calculated using the linearized, multistage dose-response model. In both cases, the variability or intermittency of exposure should be taken into account. The results should be compared and presenusing a matrix approach. Potential endangerment will be considered present if for any identifiable population group, the calculated population risks are greater than levels generally regarded as of concern (10^{-6} or 10^{-5} , depending on circumstances) or the margins-of-safety are less than those usually considered adequate.

The potential for synergistic effects should also be evaluated. Accordingly, special attention should be paid to circumstances in which sequential exposure to chemicals might occur.

SUBTASK 3F - DETERMINE ENVIRONMENTAL IMPACTS

In addition to the brief description of any past incidents specified in EPA's outline, the likelihood that the chemicals released at the site will have substantial effects on vegetation or wildlife should be assessed by comparing the predicted ambient concentrations of contaminants with those known to be toxic to test species.

SUBTASK 3G - DETERMINE DATA GAPS, RECOMMENDATIONS, AND QUESTIONS

This Subtask of the Endangerment Assessment should draw attention to data gaps and questions, and it should include recommendations for further site investigation, if necessary.

SUBTASK 3H - QUALITY ASSURANCE

The Endangerment Assessment shall be based exclusively on analytical data that have been subjected to approval QA/QC procedures, unless there is specific reason to make an exception (e.g., if invalidated or partially

validated data are the only data available). In addition to QA/QC for the analytical data, the results of transport modeling, exposure assessment, and toxicity assessment shall be subject to Quality Assurance. This shall include, at a minimum review of the assessments by an independent scientist with qualifications and experience not less than those of the project manager, and independent checking of a 10% sample of calculations and citations.

Deliverables -- An Endangerment Assessment Report covering the results of performance of the eight subtasks.

4.2.5 TASK 4 - PREPARE DRAFT REMEDIAL INVESTIGATION REPORT

Objective -- To assemble into a single document, the results of the data collection activities, analyses, and evaluations and to characterize the South Cavalcade Street Site in terms of:

- The nature, source, and toxicity of the contamination associated with the South Cavalcade Street Site;
- The extent to which contaminants have migrated from the site and the concentrations of those contaminants; and
- The environmental and health impacts of the contamination.

The report shall include the following major section:

EXECUTIVE SUMMARY

1.0 INTRODUCTION

- 1.1 Site Background Information
- 1.2 Nature and Extent of Problem(s)
- 1.3 Overview of Report

2.0 SITE FEATURES

- 2.1 Geography
- 2.2 Demography
- 2.3 Land Use

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•
•

3.0 CLIMATOLOGY

4.0 HYDROLOGY

- 4.1 Groundwater
- 4.2 Surface Water
- 4.3 Flood Potential
- 4.4 Drainage
- .
- .
- .

5.0 GEOLOGY

6.0 SOILS

7.0 HAZARDOUS SUBSTANCES

- 7.1 Waste Types, Composition, and Characteristics
- 7.2 Environmental Concentrations
 - 7.2.1 Air
 - 7.2.2 Groundwater
 - 7.2.3 Surface Water
 - 7.2.4 Soils
 - 7.2.5 Biota

8.0 PUBLIC HEALTH AND ENVIRONMENTAL CONCERNS

- 8.1 Potential Receptors
- 8.2 Public Health Impacts
- 8.3 Environmental Impacts

9.0 MANAGEMENT CONSIDERATIONS

- 9.1 Disposal Practices
- 9.2 Regulations
- .
- .
- .

REFERENCES

APPENDICES

Deliverables -- The Draft Remedial Investigation Report; for EPA review and comment.

4.2.6 TASK 5 - PREPARE FINAL REMEDIAL INVESTIGATION REPORT

Objective -- Incorporation of review comments by EPA into the Remedial Investigation Report.

Deliverables -- The final Remedial Investigation Report for the South Cavalcade Street Site.

4.3 FEASIBILITY STUDY

4.3.1 OBJECTIVE

The objectives of the Feasibility Study are to formulate and evaluate the feasibility of all possible remedial alternatives for the South Cavalcade Street Site in terms of their technical feasibility, implementability, public health risks, environmental effectiveness, institutional requirements, and costs; and by screening and evaluating the alternatives, reduce the range of possibilities to one or more that appear to be the most cost-effective. The principal goals are to recommend a remediation action that encompasses the optimum combination of environmental benefit, ease of design and construction, institutional preference and cost. Specific tasks to be performed as part of the Feasibility Study are presented below.

4.3.2 TASK 6 -- DEVELOP REMEDIAL ALTERNATIVES

SUBTASK 6A - ESTABLISH REMEDIAL RESPONSE OBJECTIVES

Objective -- To establish a set of site-specific remedial response objectives based on public health and environmental concerns and information obtained during the Remedial Investigation.

Methodology -- Site-specific information for the South Cavalcade Street Site obtained from review of the historic data, from the field investigation program, and from the endangerment assessment should be consolidated and evaluated to formulate a set of site-specific objectives for remedial response. Basic guidance should be obtained from Section 300.68 of the National Contingency Plan (NCP), 40 CFR 264 (RCRA), EPA's interim guidance documents, and the requirements of other federal, state and local regulations. Objectives for source control measures should be developed to prevent or significantly minimize migration of contaminants from the site. Objectives for off-site measures must prevent or minimize the impacts of contamination that has migrated from the site or from a disposal facility

in which the contaminants will be placed. Consultation with EPA Region VI should be an ongoing process in establishing the remedial response objectives.

Deliverables -- A memorandum report briefly presenting the response objectives and detailing the statutory and precedential backup.

SUBTASK 6B - IDENTIFICATION OF REMEDIAL ALTERNATIVES

Objective -- To develop a limited set of potential remedial alternatives for source control and/or off-site remedial actions.

Methodology -- The set of remedial alternatives that have already been developed should be refined, reduced, or augmented, as necessary, in consideration of the information obtained during the field investigations on the adjacent to the South Cavalcade Street Site and the endangerment assessment. These alternatives shall incorporate the remedial response objectives established above, but also shall include a no action and one or more options in which cleanup is not mandated. A least two of the alternative shall be consistent with relevant public health and environmental standards, including RCRA: one for an onsite alternative, and one for an off-site alternative. The other alternatives should include those that exceed applicable public health and environmental standards and those that do not attain applicable or relevant standards, but reduce the likelihood of current or future harm from the contaminants. In the latter case, one or more alternatives should be included that closely approach the level of protection provided by the relevant standards, but do not achieve those standards. As before, the remedial alternative should be directed toward components of the environment: groundwater, surface water, soils, and non-soils materials.

Deliverables -- A set of remedial response alternatives for review and approval by EPA.

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4.3.3 TASK 7 - SCREEN REMEDIAL ALTERNATIVES

Objective -- To eliminate remedial alternatives that are clearly not feasible or appropriate.

Methodology -- The list of remedial alternatives defined in Task 6, should be subjected to an initial screening using five broad considerations:

- 1) Alternatives that are or may prove to be extremely difficult to implement, will not achieve the remedial response objectives within a reasonable period of time, or included unproven or unreliable technology should be excluded.
- 2) Alternatives posing significant adverse environmental effects should be excluded.
- 3) Alternatives that do not satisfy the response objectives and do not contribute substantially to the protection of public health and the environment should be eliminated. Source control alternatives must achieve adequate control. Off-site alternatives shall minimize or mitigate the threat of harm to public health, welfare, and the environment.
- 4) Alternatives that do not meet the technical requirements of applicable environmental laws (e.g., RCRA, CWA, TSCA, Safe Drinking Water Act, HIC) most likely should be excluded from further consideration. Additional state and local regulations shall also be addressed as well as known institutional preferences.
- 5) Alternative whose costs (order of magnitude capital costs and operation and maintenance costs) far exceed those of the other alternatives and that does not provide substantially greater public health or environmental benefits should probably be eliminated. Screening for costs shall be conducted only after screening related to public health and the environment has been performed.

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Deliverables -- A memorandum summarizing the results of the screening process, the screening procedures, and the alternative to be considered for detailed evaluation.

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4.3.4 TASK 8 - PERFORM LABORATORY STUDIES/PILOT TESTING

Objective -- To obtain additional information pertinent to the remaining remedial alternatives through laboratory or bench-scale treatability studies or pilot testing. The goals are to evaluate uncertainties with respect to potential remedial measures and to establish engineering criteria for final design.

Methodology -- Additional field investigations, laboratory studies, or pilot testing needs shall be identified for the remedial alternatives remaining after the screening process. Prior to commencing the field investigations for the evaluation of the remedial alternatives, additional information may be needed, either because new alternatives have arisen or because special requirements. The benefits of combining, staging, or phasing the different components of a potential remedial action must be evaluated. Alternatives involving onsite treatment of surface water, groundwater, or soils and non-soil materials are likely candidates for pilot testing. The intent in performing this task is to delineate the requirements, devise the needed procedures, and initiate testing for those alternatives that are clearly viable, while the screening and evaluation of remedial alternatives (Tasks 7 and 9) is in progress. In this way, the Feasibility Study should not be unduly delayed.

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Deliverables -- Memorandum report summarizing the tests performed, the testing procedures and the test results.

4.3.5 TASK 9 - EVALUATE REMEDIAL ALTERNATIVES

Objective -- To evaluate the remedial alternatives remaining after the initial screening (Task 7), incorporating preliminary or final results of the laboratory or pilot testing (Task 8) and any modeling performed as part of the endangerment assessment. The goal is to arrive at a recommendation

of the most cost-effective remedial alternative or combinations of alternatives for remedial action at the South Cavalcade Street.

Methodology -- The detailed evaluation of remedial alternatives shall be carried out by performing six subtasks:

SUBTASK 9A - DETAILED DEVELOPMENT OF REMEDIAL ALTERNATIVES

Each remedial alternative should be developed in detail through consideration of the factors found in 300.68(f) through (j) of the NCP and at a minimum shall include:

- Description of appropriate treatment and disposal technologies.
- Special engineering considerations required to implement the alternatives (Input to Task 8).
- Environmental impacts and proposed methods for mitigation of those impacts, including costs.
- Operation, maintenance, and monitoring requirements of onsite remedies.
- Off-site disposal and transportation requirements.
- Temporary storage requirements.
- Staging requirements or capabilities.
- Capability for segmenting the remedial action.
- Safety requirements for implementation of the remedial action (on-site and off-site).
- Compliance of off-site alternatives with RCRA and state and local regulations.

SUBTASK 9B - TECHNICAL ANALYSIS

Each remedial alternative shall be evaluated for technical feasibility, including reliability, implementability, and safety considerations.

- Reliability: Reliability shall be evaluated based on effectiveness and durability. Effectiveness relates to the degree to which a remedial alternative can accomplish its design objectives.

Durability is a function of the projected length of time that the effectiveness can be maintained. Each remedial alternative should incorporate proven technologies that have a demonstrated, dependable record of use and that are capable of accomplishing the desired corrective results over the planned life of the remedial action; operations, maintenance, and monitoring requirements should be specified. The evaluation of effectiveness and reliability will be in relative terms; alternatives that minimize or eliminate the potential for further or future releases of contaminants to the environment are considered more effective and reliable than those that do not have the same capability.

- **Implementability:** Implementability shall be based on whether an alternative has been employed successfully at one or more other sites that are similar to the South Cavalcade Street Site or whether research and development has been successfully completed. Factors to be considered in assessing implementability include ease of design and construction, the capability for phasing or segmenting the remedial action into operable units and discrete areas of the site, and special engineering requirements.
- **Safety:** The safety of a remedial alternative is a reflection of the security and freedom from risk, loss, injury, harm, or danger. Major risks are from fire, explosion, and exposure. The scope of safety considerations encompasses those living in the community around the state and those working on the site, either in implementing the remedial action or in subsequently operating and maintaining it. Safety considerations also include risks associated with failure of the remedial alternative.

SUBTASK 9C - INSTITUTIONAL LEGAL/POLICY ANALYSIS

The endangerment assessment described in Task 4 of the Remedial Investigation constitutes the environmental and health assessment of the "No Action" remedial alternative. For each of the remedial alternatives being considered in Task 9 of the Feasibility Study, a parallel exposure assessment

shall be performed to evaluate the extent to which the alternative reduces or eliminates the endangerment to public health, welfare, and the environment. Thus, for each alternative, the extent that the proposed action reduces or eliminates the propensity for the contaminants to migrate should be determined. The results can then be used to calculate the extent to which exposure (and hence risk) is reduced via exposure pathways. The results should be presented in tabular or matrix format to facilitate comparison among various alternatives. Alternatives that will fail to reduce public health risks to acceptable levels shall be identified.

SUBTASKS 9D - ENDANGERMENT ASSESSMENT

For each alternative remaining after initial screening, the environmental effects shall be compared. Adverse impacts need to be evaluated only within the individual scope of each alternative. However, as described in Section 3.4.4, detailed assessments may not be required for all alternatives. In these cases, it is assumed that no adverse environmental effects will be caused by implementation of the alternative plan. Known environmental impacts of each alternative should be compared to the environmental effects caused by the no action alternative and with other alternatives with recognizable environmental impacts. Alternatives that fail to meet applicable environmental standards and criteria shall be identified.

SUBTASK 9E - INSTITUTIONAL/LEGAL POLICY ANALYSIS

Institutional concerns include such factors as zoning and right-of-way requirements, transportation restrictions, discharge and construction permits, worker health and safety issues, and other aspects of existing federal, state, and local regulations that might bear on the South Cavalcade Street Site. Superfund remedial actions must achieve the functional equivalency to NEPA actions. Institutional concerns also include coordination with federal, state, and local agencies and institutional requirements, safeguards, and preferences in implementing the remedial action. These concerns shall be addressed.

SUBTASK 9F - COST ANALYSIS

The costs of each remedial alternative remaining after the initial screening (Task 7) shall be evaluated as a present worth cost, including total capital costs and annual operating and maintenance costs for the life of the project. In developing these costs, the following steps shall be performed:

- Estimate capital costs and annual operating and maintenance costs
- Calculate the stream of payments and present worth
- Evaluate the risks and uncertainties in the cost estimates; estimates should be within ± 50 and ± 30 percent of the actual costs
- Identify input data and reliability necessary to evaluate the cost effectiveness of the remedial alternatives

These data can then be arranged in a tabular format to facilitate evaluation of the alternatives.

SUBTASK 9G - SUMMARY OF ANALYSES AND RECOMMENDATIONS

The purpose of this Subtask is to bring together in a succinct summary the results of the detailed evaluations performed in the previous five subtasks (technical feasibility, public health, institutional, environmental, and costs) and to recommend the most cost-effective remedial alternative. The recommendation shall be justified by comparison of the relative advantages and disadvantages of the recommended alternative as compared to the other alternatives evaluated, including the extent to which the remedial alternatives meet the technical requirements and environmental standards of applicable environmental regulations. To the extent possible, evaluation criteria and considerations shall be applied uniformly to each of the remedial alternatives; special consideration will be addressed where necessary. The most cost-effective alternative shall be the alternative with the lowest present work cost that is technically feasible and that adequately protects or mitigates the damages to public health, welfare, and the environment.

Deliverables -- The deliverables for Task 9 include an oral briefing to EPA on the completion of the remedial alternatives evaluation. The remedial alternatives evaluated, the evaluation procedures, and the results shall be detailed in the briefing as should the justification for selecting the recommended alternative. The summary table prepared in Subtask 9F should provide the basis for the briefing.

4.3.6 TASK 10 - DEVELOP CONCEPTUAL DESIGN

Objective -- To prepare a conceptual design for the recommended remedial alternative.

Methodology -- A conceptual design shall be prepared for the recommended remedial alternative. The conceptual design should include, but will not be limited to the following:

- General engineering approach
- Implementation schedule
- Special implementation requirements
- Institutional requirements
- Phasing and segmenting capabilities and requirements
- Preliminary design criteria
- Preliminary site and facility layouts
- Estimated costs
 - Capital costs
 - Operations and maintenance costs
- Operating and maintenance requirements
- Safety requirements for implementation
 - Off-site
 - Onsite
 - Costs of implementation
- Additional information as needed

Deliverables -- Memorandum report describing the recommended remedial alternative and presenting the conceptual design.

4.3.7 TASK 11 - PREPARE DRAFT FEASIBILITY STUDY REPORT

Objective -- To present the results of the feasibility study; Tasks 6 through 9.

Methodology -- A draft Feasibility Study Report shall be prepared summarizing the results of Tasks 6 through 9. The report shall include the following major sections:

- 0.0 Executive Summary
- 1.0 Introduction
 - 1.1 Site background
 - 1.2 Nature and Extent of Problem
 - 1.3 Objectives of Remedial Action
- 2.0 Screening of Remedial Action Technologies
 - 2.1 Technical Criteria
 - 2.2 Environmental and Public Health Criteria
 - 2.3 Institutional Criteria
 - 2.4 Other Screening Criteria
 - 2.5 Cost Criteria
 - 2.6 Remedial Action Alternatives Development
- 3.0 Remedial Action Alternatives
 - 3.1 Alternative 1 (No Action)
 - 3.2 Alternative 2
 - 3.n Alternative n
- 4.0 Results of Laboratory/Pilot Tests
- 5.0 Analysis of Remedial Alternatives
 - 5.1 Non-Cost Criteria
 - 5.1.1 Technical Feasibility
 - 5.1.2 Environmental Feasibility
 - 5.1.3 Institutional Requirements
 - 5.1.4 Endangerment Assessment
 - 5.2 Cost Analysis
- 6.0 Summary of Remedial Alternatives
- 7.0 Recommended Remedial Alternative
- References
- Appendices

Deliverables -- Ten bound copies of the draft Feasibility Study Report.

4.3.8 TASK 12 - PREPARE FINAL FEASIBILITY STUDY REPORT

Objective -- To incorporate review comments from EPA on the draft Feasibility Study Report into a final Feasibility Study Report.

Deliverables -- Ten bound copies of the final Feasibility Study Report. The contents shall be the same as the draft Feasibility Study Report with the exception that an additional section responsive to the review comments shall be included.

4.4 ADDITIONAL REQUIREMENTS

4.4.1 TASK 13 - PERFORM EPA DESIGNATED ACTIVITIES

Objectives -- To assist EPA in presenting the results of the Remedial Investigation/Feasibility Study effort and to assist in the development of a Record of Decision.

Methodology -- On an as needed basis, fact sheets, site diagrams, and other information shall be prepared at the request of EPA for presentation at meetings. In addition, assistance shall be provided to EPA as needed in preparing the Record of Decision through preparation of technical information, and attendance at meetings.

Deliverables -- Technical support, assistance, and attendance at meetings, as required.

4.4.2 TASK 14 - PROJECT MANAGEMENT

Objective -- To maintain effective communications with EPA on the technical and financial progress of the Remedial Investigation and the Feasibility Study.

Methodology -- The scope of this task is discussed in Section 5 of this Work Plan.

Deliverables -- Summaries of meetings; monthly reports.

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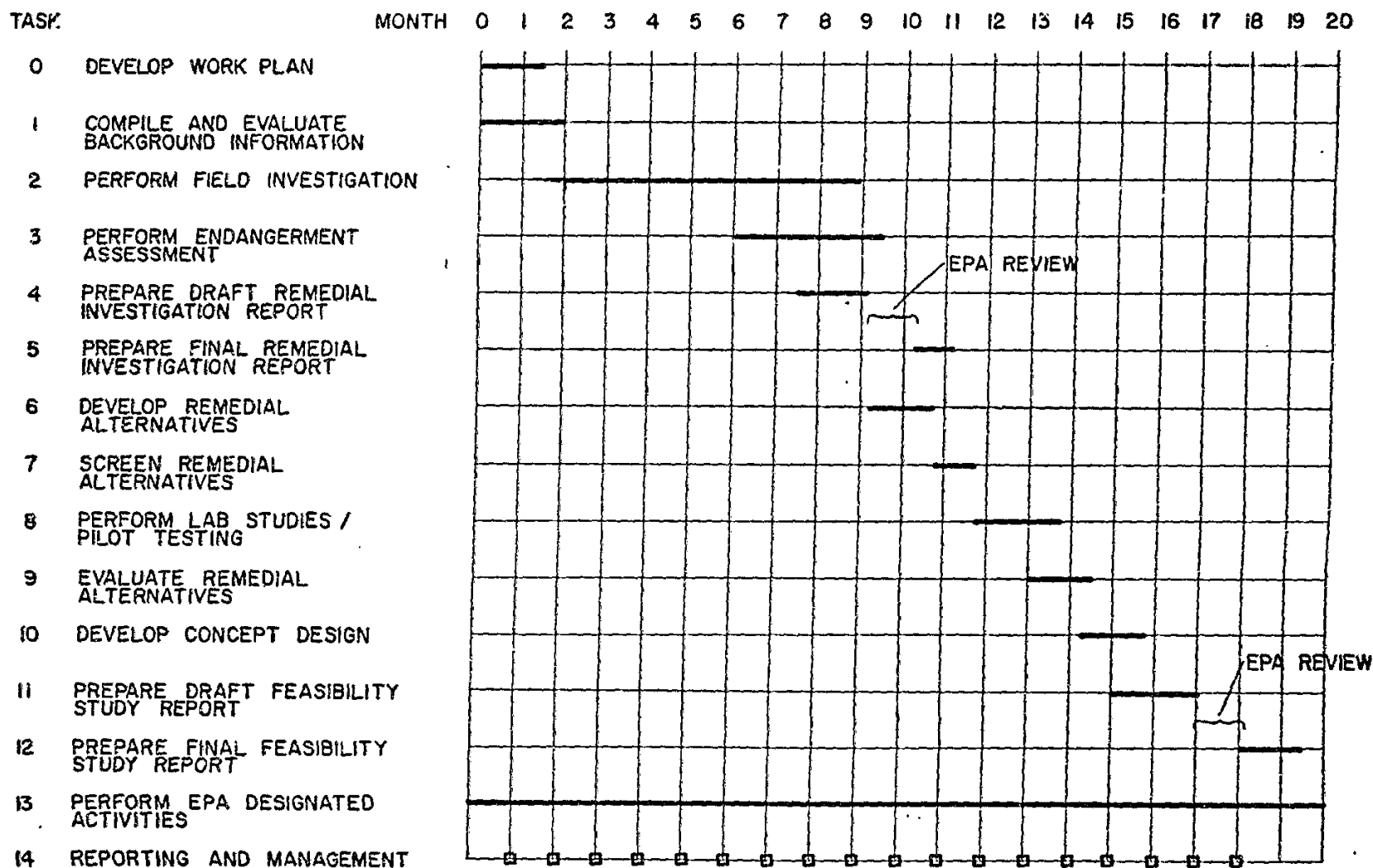


FIGURE 5-2.

PROPOSED PROJECT SCHEDULE FOR THE KOPPERS/CAVALCADE RI/FS

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